MUNICIPAL JOURNAL AND ENGINEER

VOLUME XVIII NEW YORK, MAY, 1905 No. 5

THE BUILDING OF A CITY

The City Plan—The Fixtures Below and Above the Pavements—Parks and Play Grounds—Transportation—Municipal Art—Methods Employed by Cohoes

THE building of a city is a many sided problem. Unfortunately this fact is never realized until the city has sprung into being and been rudely awakened to the necessity of correcting certain abnormal conditions, which may threaten the public health, the commercial prosperity, and, perhaps, its civic life. These conditions have arisen simply because the future growth of the city was not foreseen and comprehensive plans prepared for its development. It is understood, of course, from the nature of the case, that this foreknowledge could not exist in the mind of any one man nor group of men. But, after a city apprehends its malformation and the urgency for shaping its future expansion, it is unpardonable for its officials and citizens to sit with folded hands and to make no effort to rectify its mistakes nor seek to better its prospects.

THE CITY PLAN IS IMPERATIVE

Except in rare instances, no city has had the privilege of choosing its site; that choice was determined by chance long before the city of the future was dreamed of. Hence, no blame attaches to the present generation for an unwise selection, if it happen to be such. But, having been aroused to the need of making certain alterations in its streets, public squares and the direction of its future growth, it is worse than unwise—it is rank and wilful stupidity—to ignore the condition. The first step for any city, town or village to take, before any extensive improvements are planned for, is to give the question of a city, town or village plan, a most thorough investigation, so that the best plan possible may be evolved, after which present and future improvements may be made. This is imperative if the best is to be attained in the development of any community. Moreover, it would show greater wisdom and sagacity than has thus far been manifested by the vast majority of American municipalities, if the officials and citizens would insist upon the formation of city, town or village plan which should give due consideration to the present and future provisions for parks and playgrounds, for transportation, sewer, water, lighting, telephone and heating systems, and municipal embellishment, before any further improvements were made. Such a course would prevent the wasting of thousands and millions of dollars in every decade, in every municipality, as a large per cent. of all monies spent annually, by American municipalities, is practically wasted.

For example, if the founders of New York City could have known of its growth in population, commerce and importance, it is only fair to suppose they would have planned more wisely for their posterity. Hence, the plotting of the streets and avenues, the provision for parks and playgrounds, water and light systems, transportation and communication facilities, would have been arranged for in a more comprehensive manner.

THE GOOD EXAMPLE OF COHOES

The city of Cohoes, N. Y., contrary to the usual practice by American cities at the time the extensive improvements were proposed, secured authority from the State Legislature for the appointment of "The Public Improvement Commission" in 1896, which provided that two of the commissioners should be appointed from the political party polling the greatest number of votes cast at the last general election and two from the party casting the next largest number of votes. By an error in the creative act the Commission so appointed did not enter upon its work until two years later, 1898. The Commission so created completed its work last year and the final report submitted from which this article is compiled. The MUNICIPAL JOUR-

Courtesy Improvement Commission

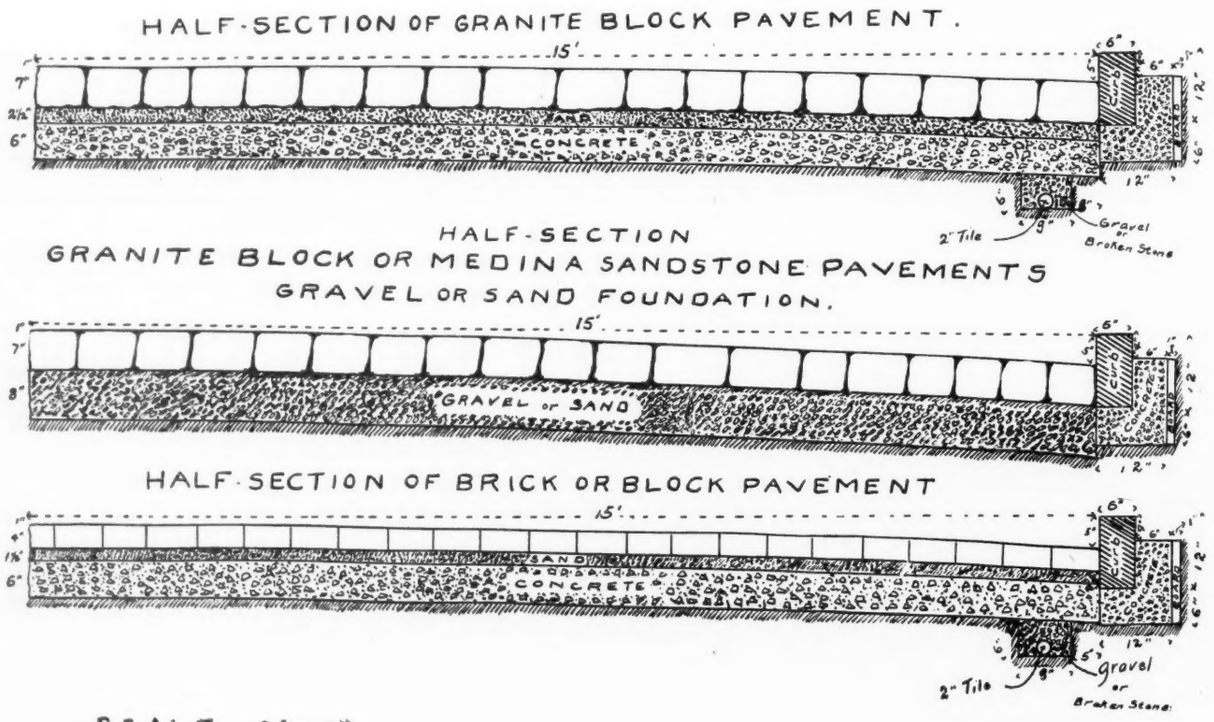
GRANT STREET FROM VINE STREET, APRIL, 1900—COHOES, N. Y.

NAL is indebted to the Chief Engineer of the Commission, Edward Hayes, C. E., for the use of the illustrations used with this article.

The Commission had the responsibility of determining what public improvements should be made, to cost, in the aggregate, about $700,000. This, for a city of about 25,000 population, was a commendable but great undertaking, and manifested an intelligence in its public spiritedness seldom found among American cities.

CIVIC CONDITIONS PREVIOUSLY NEGLECTED

For twenty years prior to this date, public improvements in Cohoes had been steadily neglected. Its sewerage sys-



Courtesy Improvement Commission, Cohoes, N. Y.

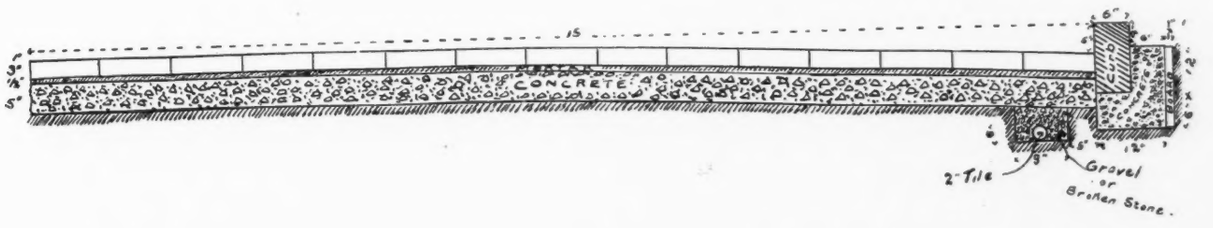
Courtesy Improvement Commission

GRANT STREET FROM VINE STREET, SEPTEMBER, 1904, PAVED WITH ASPHALT—COHOES, N. Y.

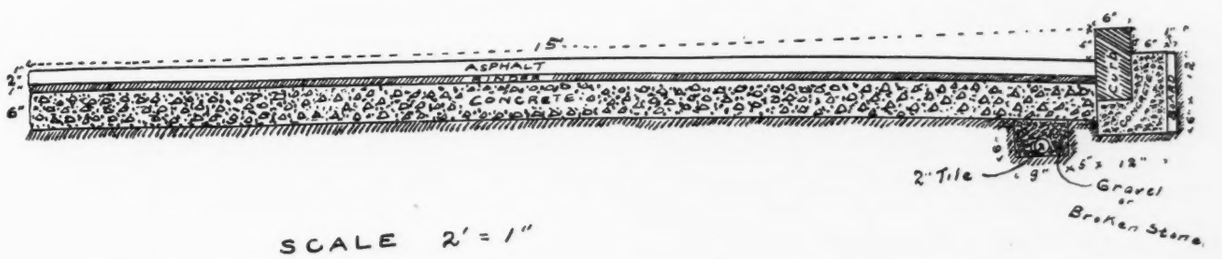
tem was inadequate, so that the sanitary conditions had become a menace to the public health. As to pavements there were but few and these were in a dilapidated condition, most of which were worse than none at all. Little attention had been given to public parks, playgrounds, public buildings or the orderly and æsthetic development of the city. Such was the condition confronting the Commission.

Naturally the first duty involved the laying out of a proper sewer system. Prior to 1896, the city had built at different times about seven and one-half miles of sewers, at an aggregate cost of $100,000. These sewers had been built as necessity demanded, and without regard to any

HALF-SECTION OF ASPHALT BLOCK PAVEMENT.



HALF-SECTION OF SHEET ASPHALT PAVEMENT



SCALE 2' = 1"

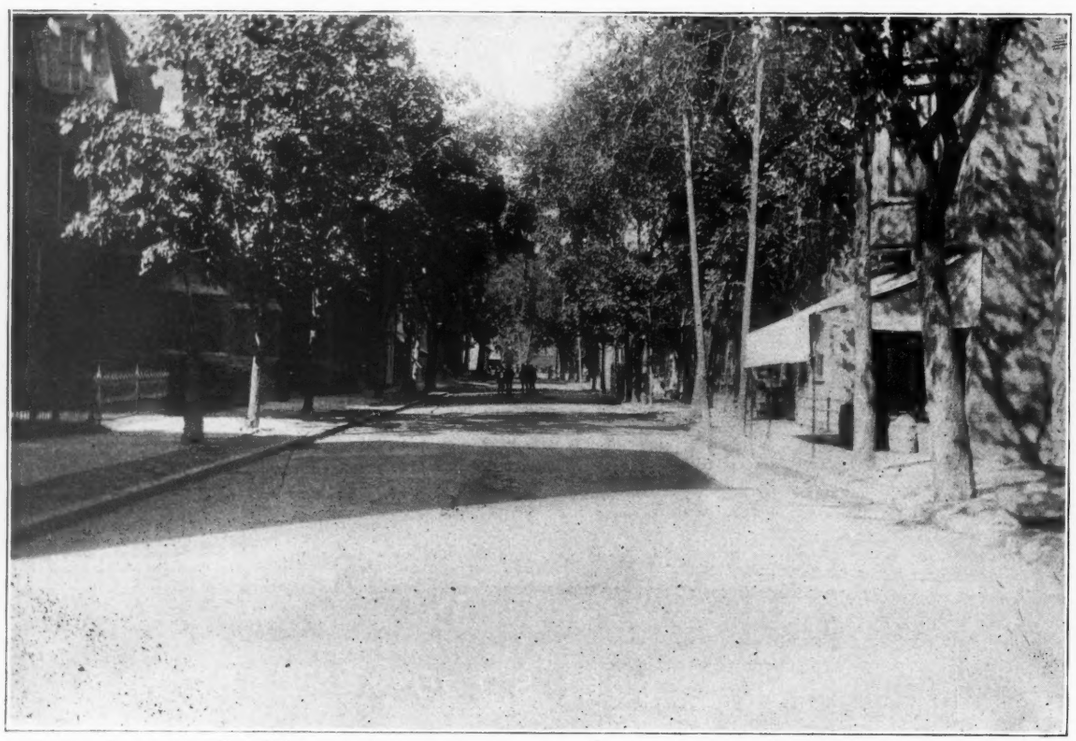
Courtesy Improvement Commission, Cohoes, N. Y.

Courtesy Improvement Commission

CONGRESS STREET FROM HART STREET NORTH, APRIL, 1900—COHOES, N. Y.

plan which should include the proper drainage and care of the sewage for the whole city.

As soon as the new commission was organized, a prize of $700 was offered for the best plan, specifications and estimate for a system of sewers for the city. Seven plans in all were presented, which did not include two plans, one marked "Hudson River" and another marked "Mohawk Plan." The plans offered in competition were referred to a committee in 1898, and the one marked "I. X. L.," which happened to be the Hudson River plan, was finally adopted. The work of constructing the sewer system extended through to 1902, when, for the first time in its his-



Courtesy Improvement Commission

CONGRESS STREET FROM HART STREET NORTH, JUNE, 1901, PAVED WITH BRICK—COHOES, N. Y.

Courtesy Improvement Commission

BROADWAY FROM YOUNGLOVE AVENUE, APRIL, 1900—COHOES, N. Y.

tory, the city could be said to be on a sanitary basis. At the same time the various gas and water conduits were laid so that the streets were in a proper condition to be paved.

CONSTRUCTION OF PERMANENT PAVEMENTS

Before the construction of permanent pavements, the entire city plan was carefully studied by the Commission, for the purpose of determining the choice and location of the various kinds of pavements; due care being given to the selection of such pavements as would be best adapted for the particular locality. In connection with this the plan

Courtesy Improvement Commission

BROADWAY FROM YOUNGLOVE AVENUE, OCTOBER, 1904, PAVED WITH BRICK—COHOES, N. Y.

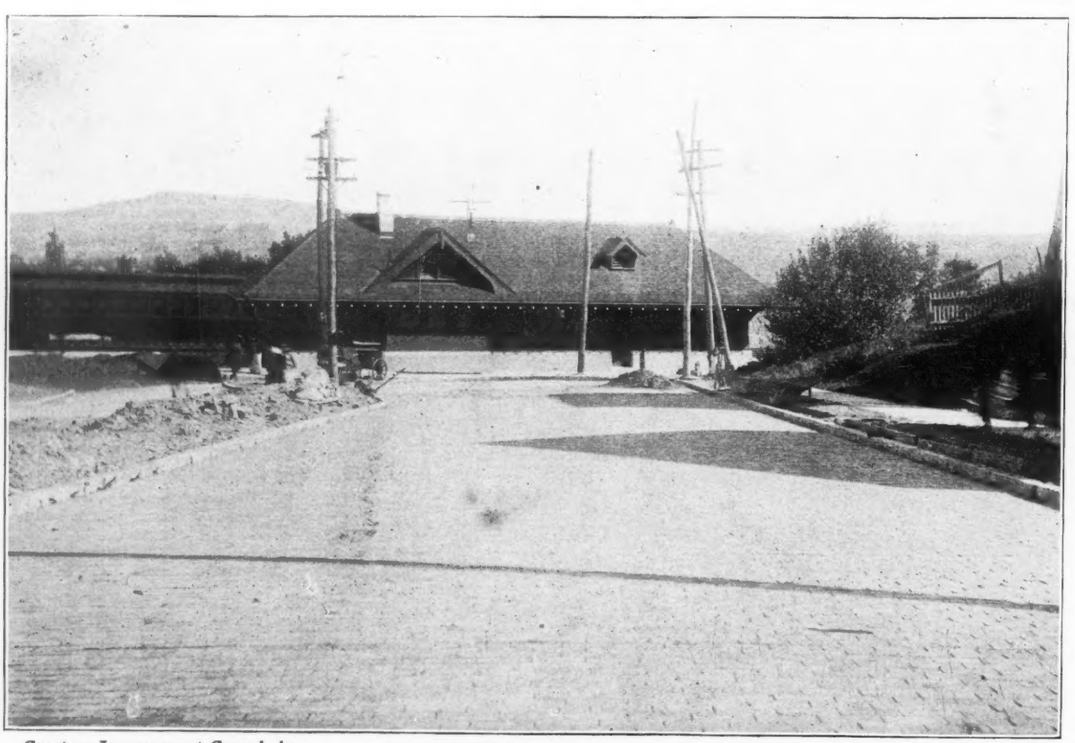
of narrowing the width of the roadway of some of the paved streets was carried out. It was determined that a certain ratio between the width of the street and the sidewalk should be settled upon, which was one to six; that is, the width of the sidewalk should not be less than one-sixth of the street. If the total width of the street was sixty feet, the roadway would be from forty-eight to fifty feet wide. On residential streets the width was reduced to twenty-five feet. The width of the sidewalk on streets having a total width of sixty feet, was seventeen and one-half feet. By this division a space of about six feet on both sides of the walk proper remained for grass and trees. While there was some opposition to this plan, it was for the most part generally approved, and of all the streets so paved only one was afterwards changed. Most of the property owners along the lines of the residential streets were careful to improve their street lawns. The making of these lawns had a marked influence upon the whole city. While many of the streets are narrower than formerly, there is an abundance of room for teams to pass or turn around.

The advantages of treating streets in this way are: First, the cost of the pavement is less, which is quite an item in some of these streets; second, the extra cost of maintenance and cleaning is avoided. There is no necessity for having the street wider than will accommodate the traffic. It must be conceded that it is more pleasing to see a well paved roadway of ample width, with well kept lawns and shade trees on each side, than to have an extreme width of roadway, with only the bare walk on the sides.

Many Improvements Yet to Be Made

While the commission has finished the expenditure of its $700,000, much yet remains to be done in the city; but it is generally believed that the city has derived greater benefits from the expenditure of this large sum of money than could possibly have been attained without the planning and forethought given to the whole question. For this reason, it is more than probable that all future large expenditures, devoted to the development of the city, will be provided for in a similar manner. Many problems still remain unsolved, not because the Commission had not the ability to consider the plans, but because the necessary funds were lacking. The sewer system will need extending and the same is true with regard to the conduits of the various public service corporations, such as water, gas and electric light. There is a chance for improvement in public squares and parks. Some streets will have to be widened, the grades of others changed and there are a hundred and one little details, such as street signs, trolley poles, electroliers for public lighting and other street fixtures, which will require the attention of some commission in the future.

That it is a wise plan for a city to follow the example of a business corporation, in so far as it involves careful forethought, before expenditures for improvements are made, can no longer be questioned. It is to be hoped that for the future welfare of the city, from a commercial, social and æsthetic standpoint, its further development may be as carefully and intelligently carried out by some future commission.



Courtesy Improvement Commission

YOUNGLOVE AVENUE FROM IMPERIAL AVENUE EAST, OCTOBER, 1904, PAVED WITH BRICK—COHOES, N. Y.

CITY MADE CHARTERS*

A Study in Municipal Home Rule—Its Origin and Development as Given by an Expert—Concluded in June

By Milo Roy Maltbie, Ph.D.†

MILO ROY MALTBIE

LEGISLATIVE VETO IN CALIFORNIA

AT the expiration of a specified time after ratification (e. g. thirty days in Missouri and Minnesota), the measure becomes the charter of the city without action, except the usual procedure to complete the official record. This is true in all States except California, where, as noted before, the proposed draft must be submitted to the legislature for its approval or rejection as a whole, without the power of alteration or amendment. When approved by a majority vote of all members of each house, it becomes the charter of the city submitting it, without the approval of the Governor.[1]

This legislative veto has had little effect, for nearly a score of charters and numerous amendments have been acted upon by the legislature, and in no case (so far as I have been able to learn) has one been rejected or its passage unnecessarily delayed. Further, the possibility of rejection, now reduced to a minimum, has no effect upon the charter makers, and each city drafts such a charter as seems best adapted to its needs. At the same time, the veto power does exist and might be exercised if a city undertook to go beyond its sphere. But undoubtedly more dependence is put upon the courts to keep the cities within bounds than upon the legislature. The other States have not felt the need of following the example of California.

SCOPE OF CHARTER-MAKING POWER

This naturally brings us to the question: How far may cities go in drafting their own charters?

In the first place, not every city has this privilege. It must have a population of 100,000 in Missouri, 20 000 in Washington, 3,500 in California, and 2,000 in Colorado. The Minnesota Constitution provides that any city, or any village which is to become thereby a city, may frame its own charter, thus throwing down the bars completely. California adopted 100,000 as a minimum in 1879, but the results were so satisfactory that it was reduced to 10 000 in 1887, and then to 3,500 in 1890. The Colorado Constitution fixes no precise limit except that cities of the first and second classes only have this power. It does not say what shall constitute a city of the first or second class, but it does say that the number of classes shall not exceed four (Art. XIV, Sec. 13). At present all urban centers having more than 2,000 inhabitants are in these classes; but there is nothing to prevent the legislature from reclassifying cities at any time so as to extend or restrict the home rule privilege. In every State the power of defining a city rests with the legislature, but there has been no attempt to abuse it. The tendency has been towards an extension of the privilege, rather than towards its restriction, the most recent provisions being most comprehensive.

The number of cities, according to the census of 1900, which possessed the required population was three in Missouri (St. Louis, Kansas City, and St. Joseph), three in Washington (Seattle, Spokane, and Tacoma), twenty-eight in California, sixteen in Colorado, and fifty-three in Minnesota.

CONSTITUTIONAL RESTRICTIONS

Every constitution contains further restrictions. The original provision in the Missouri Constitution conferred power to "frame a charter for its own government consistent with and subject to the Constitution of this State." It also provided that such charter should "supersede any existing charter and amendments therof." Similar provisions appear in the other four constitutions. These are very general statements and do not carry one far, but it is possible to deduce a few general principles therefrom. As the courts construe very narrowly a grant of power to a municipal corporation, it is clear (1) that a freeholders charter may not deal with other than local matters, (2) that the power to frame a charter is subject to the restrictions found elsewhere in the constitution, and (3) that the laws of the State passed in accordance with the constitution are also paramount. These principles suggest several questions of great practical importance: (1) what are the constitutional restrictions upon the power of the city? (2) In case of conflict between an act of the legislature and a charter, which is supreme? (3) What are municipal affairs?

In the main, the restrictions upon the city's power are the same that obtain generally throughout the United States. They have to do with the rights of the individual, the maximum amount of local indebtedness, the taxing power, the suffrage, the use of public credit and public funds, etc. Three States have gone further and imposed specific restrictions upon the powers of the city. In Missouri, freeholders charters must provide for a Mayor, or Chief Magistrate, and a bicameral council, at least one house of which must be elected on a general ticket. None of the other States under consideration has adopted this provision except Minnesota, and here the city may have a unicameral council if it chooses. The Colorado Constitution goes furthest of all

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* Since this article first appeared in the *Yale Review* the Constitutional Home Rule committee of New York City has been formed with the following gentlemen as officers: John G. Agar, president; Herman A. Metz, vice-president; Milo R. Maltbie, secretary. As stated in the constitution of the committee: "The objects of the committee shall be the promotion in the City of New York of the cause of home rule for the cities of the State by constitutional amendment, and the encouragement of the organization and co-operation of similar committees throughout the State."—[EDITOR.

† The writer wishes to acknowledge his great indebtedness to the scores of persons he has seen and communicated with upon this subject. If it were possible to mention them all by name, he would be glad to do so. His appreciation of their helpfulness is none the less, however.

[1] See Brooks vs. Fischer, 79 Cal. 173. No limit is fixed within which the legislature must act, and it would be better if the constitution stated that the charter should take effect unless disapproved within a specified time.

Courtesy Improvement Commission

LANCASTER STREET FROM COLUMBIA STREET NORTH, APRIL, 1900—COHOES, N. Y.

by requiring, among other things, that the departments of fire, police, public utilities, and public works shall be subject to civil service regulations, that no franchise shall be granted except upon vote of the qualified tax-paying electors, and that provision shall be made for popular initiative and referendum upon local measures.

Comparatively speaking, these restrictions are not important, and so far as the constitution goes, the cities are left free to deal with *local affairs* as they see fit. Indeed, in subsequent pages, we shall see how, when the courts have tended narrowly to define "municipal affairs," the people through constitutional amendments have extended local autonomy by grants of power to do specific acts.

City's Power Over Special Acts

One would infer that as a home rule charter supersedes "any existing charter and amendments thereof," it would annul any special act. The authority to frame its own charter would mean little, if the legislature could regulate municipal matters by local laws. The city could then act only in absence of legislative action, and any semblance of conflict would be decided by the courts against the charter. But the constitutions of two States—California and Washington—have left no doubt about it, and have provided that all special laws are superseded, so far as they conflict and so far as the city in question is concerned, by freeholders charters. Indirectly the same result is achieved in Minnesota, Missouri, and Colorado by the constitutional prohibitions against special legislation and by decisions of the courts. Either freeholders charters are, therefore, superior to special acts or the possibility of conflict is removed by a prohibition against special legislation.

What Are Special Laws?

This brings us face to face with the question, What are *special* laws? Not a single constitution undertakes to define them directly, but each contains certain provisions which will throw some light. The Missouri Constitution, for instance, directs the legislature to provide by general laws for the organization and classification of cities, but limits the number of classes to four and directs that all of the same class shall possess the same powers and be subjected to the same restrictions.[1] In interpreting this provision, the courts have held that while these restrictions do not apply to other than municipal affairs, they are to be firmly upheld when such matters are dealt with and the laws which are general in form but not applicable to all cities of one of these four classes are unconstitutional.[2]

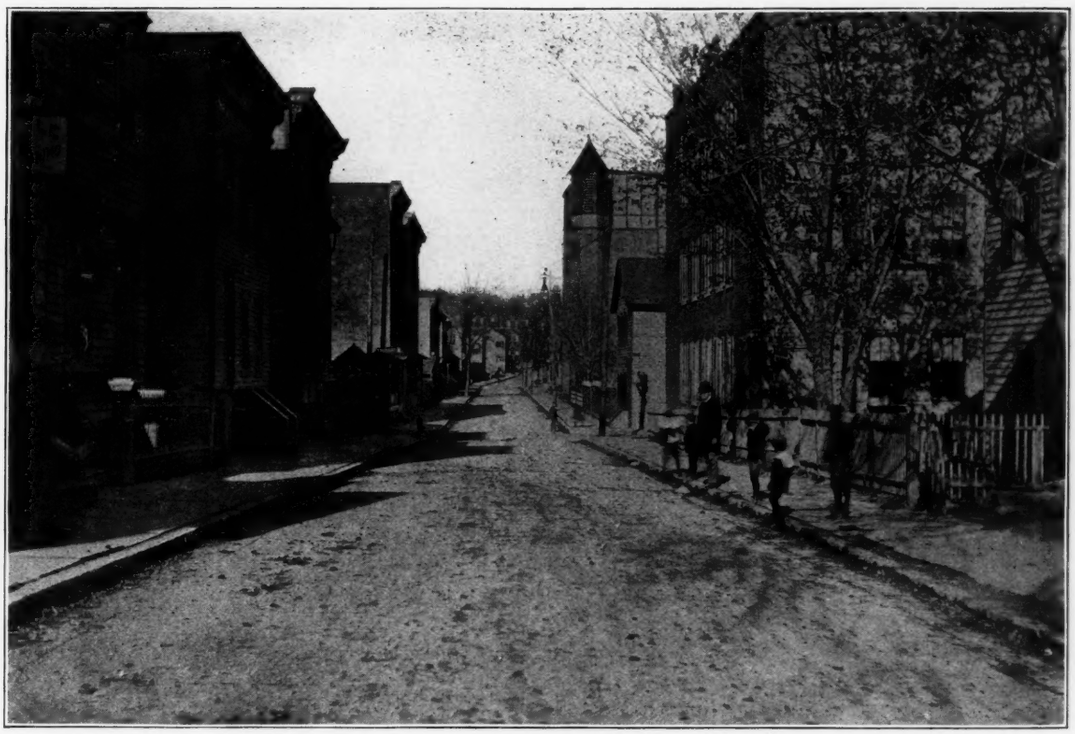
The Colorado Constitution contains similar provisions,[3] but neither the Caliornia nor the Washington Constitution limits the number of classes. The California legislature has taken advantage of this to make seven groups, drawing the dividing lines at 200,000, 100,000, 30,000, 15,000, 10,000 and 3,000.[4] In Washington there are three classes, fixed by the legislature as follows: all above 20,000, all between

[1] Art. IX, Sec. 7. The present classification is as follows: 1st class—100,000 population or more (three by the census of 1900); 2d class—30,000 population or more, and less than 100,000 (none in 1900); 3d class—3,000 population or more, and less than 30,000 (39 in 1900); 4th class—500 population or more, and less than 3,000 (168 in 1900).

[2] See *Murname vs. St. Louis*, 123 Mo. 479, and *Kansas City vs. Scarritt*, 127 Mo. 642. The court was subjected to considerable criticism in the latter case. Upon motion for a new hearing, it pointed out the difference between State and local matters, and added that as park administration—the subject under consideration—was a local function, the court had not reversed itself.

[3] Art. XIV, Sec. 13 and 14. The legislature has made but two classes so far. In the first are all cities of 15,000 population or over; in the second, all below 15,000 and above 2,000. According to the census of 1900 there were three cities entitled to be in the first class and thirteen in the second.

[4] In 1900 there was one city in the first class, one in the second or "first and one-half class," one in the third, five in the fourth, two in the fifth, twenty-three in the sixth, and forty-five in the seventh.



Courtesy Improvement Commission

LANCASTER STREET, NOVEMBER, 1900, FROM COLUMBIA STREET NORTH, PAVED WITH ASPHALT—COHOES, N. Y.

20,000 and 10,000, and all between 10,000 and 1,500.[1] The Minnesota Constitution resembles those of Missouri and Colorado, limits the number of classes to four, and goes farther than any other in prescribing that the first class shall include all cities of over 50,000 population, the second all having 50,000 or less down to 20,000, the third all between 20,000 and 10,000, and the fourth 10,000 or less.[2]

In each case, either by an express or implied provision, a special act is taken to mean an act which does not apply to all cities of a class. But as has been seen, certain classes contain only a single city. In such instances, it is evident that there is little practical difference between a general act and a special act, the principal one being that a general act must be so drawn that, while it may then apply only to one city, it will apply to any other city or cities should they enter that class by reason of increasing population.

General Laws Supreme in State Matters

This brings us to the question: Does a general law—a law applicable to all cities of a class—supersede the freeholders charter? In answering it, we must distinguish between State and local matters. First, as to State matters.

I do not know of any provision in these constitutions or of any decision of the courts which states or intimates that a general law upon matters other than municipal is superseded and annulled by a freeholders charter. There have been instances where, in absence of State laws, the courts have upheld charter provisions relating to matters of general interest, but never in case of direct conflict of jurisdiction. There have been other instances also, in which it would seem that the bench had gone a little too far in upholding the charter provisions, but it has always been upon the ground that these provisions dealt with a municipal and not a State function. The California Constitution states that a freeholders charter shall supersede "all laws inconsistent therewith," but this has never been interpreted to include general laws relating to State matters.

Powers of the Legislature in Municipal Affairs

In the domain of municipal affairs, the situation is entirely different. The decision in the case of *Kansas City ex rel. vs. Scarritt,* 127 Mo., 642, laid down the rule that the constitutional provision requiring freeholders charters to be consistent with and subject to the laws of the State was not intended to apply to municipal affairs, but to provide that laws for the State at large should not be abrogated by city charters. The case arose over a conflict between an act of the legislature passed in 1893, relating to park administration and a freeholders charter adopted by Kansas City the year previous. Having been reaffirmed, it is now the accepted rule in Missouri.[1]

The California rule was originally different. The constitution as adopted in 1879 stated that a freeholders charter was to supersede all *special* laws inconsistent therewith, and the court construed this to mean that a general law was to be paramount to a freeholders charter.[2] This did not suit the cities and an amendment to the constitution was prepared, passed by the legislature, and endorsed by the people in the fall of 1892, by a vote of 114,617 to 42,076.[3] It struck out the word "special," and thus made a free-

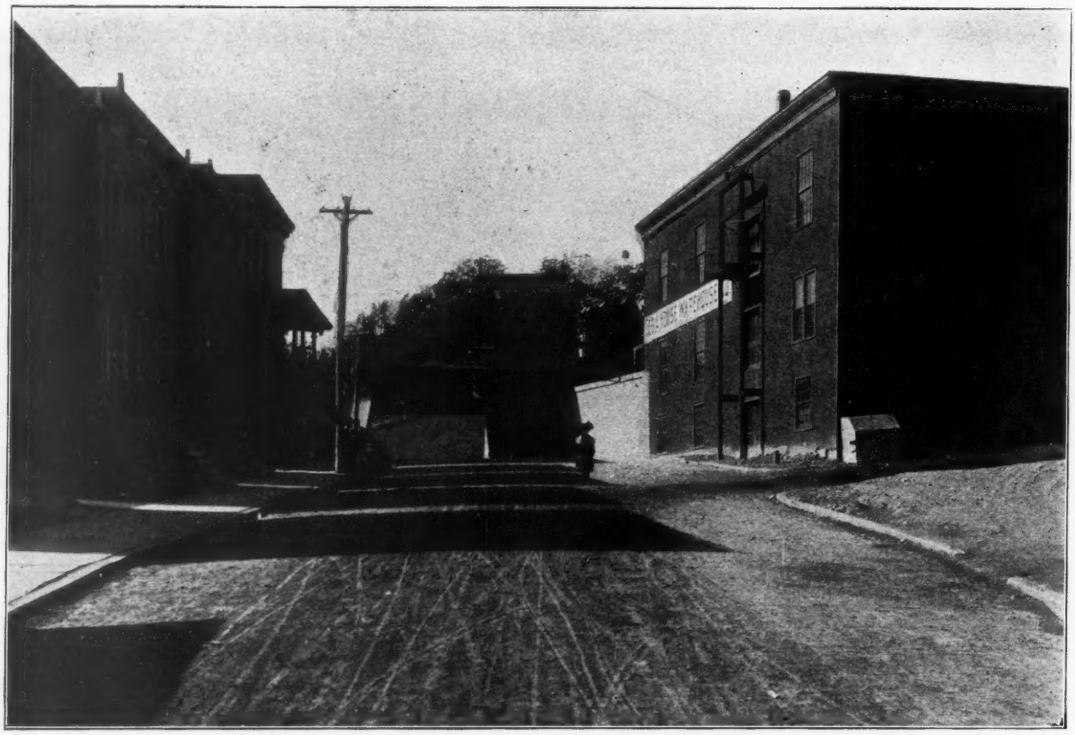
[1] The first class contained three cities in 1900, the second one, and the third nineteen.

[2] Art. IV, Sec. 36. In 1900 these classes contained three, none, three, and forty-seven cities respectively.

[1] See *Kansas City vs. Lorber,* 64 Mo. Ap. 604; *Kansas City vs. Bacon,* 147 Mo. 259; and *Kansas City vs. Mastin,* 169 Mo. 80.

[2] *Davies vs. Los Angeles,* 86 Cal. 31. See also *Ex Parte Ah You,* 82 Cal. 342; *Kennedy vs. Board of Education,* 88 Cal. 483; and other cases cited in these decisions.

[3] Oberholtzer, *The Referendum in America,* p. 354-5.



Courtesy Improvement Commission

HIGH STREET FROM CANAL BRIDGE, OCTOBER, 1904, PAVED WITH GRANITE—COHOES, N. Y.

holders charter superior to " all laws inconsistent with such charter."

This amendment did not clear the atmosphere as expected, for another section in the constitution (Sec. 6) empowered the legislature to pass general laws for the incorporation and organization of cities, and expressly stated that all charters " framed or adopted by authority of this constitution shall be subject to and controlled by general laws." It made no exception of municipal affairs, and it became apparent that the courts might still hold that general laws, even in municipal affairs, were supreme. Further, if the legislature should adopt an elaborate classification of cities, thereby placing each city in a class by itself as was done in Ohio, the restriction to *general* laws would be useless. In 1896, another amendment was added providing that all charters " framed or adopted by authority of this constitution, *except in municipal affairs,* shall be subject to and controlled by general laws." As a result, there is now no question but that a freeholders charter in California takes precedence over a general law in municipal matters,[1] and has the same effect and force as a legislative statute prior to the adoption of the home rule amendment.[2]

The original California provision was incorporated in the Washington Constitution, and it has not been amended as in the former State. The questions which arose in California have not yet been adjudicated in Washington, but it seems probable that the rule when fully and finally decreed will be the same as in California formerly, viz., that a city-made charter is subordinate to a general law in case of conflict in municipal matters.[3]

[1] Court so decided in the case of *Ex Parte Braun,* 141 Cal. 204. See also *Byrne vs. Drain,* 127 Cal. 663; and *Banaz vs. Smith,* 21 Cal. Dec. 735.

[2] Cf. *State vs. Zimmerman,* 86 Minn. 353.

[3] See *Tacoma Gas and Electric Light Co. vs. Tacoma,* 14 Wash. 288; and dicta in *Reeves vs. Anderson,* 13 Wash. 17.

The Minnesota Constitution expressly declares that the legislature shall determine under what restrictions the cities shall draft their own charters, and that before any city acts it must fix these limitations. It also empowers the legislature to enact general laws relating to the affairs of cities which shall be paramount to the provisions relating to the same matters in local charters and ordinances.

The apparent effect of these provisions is to place Minnesota in the same class with Washington. In neither State, however, has the legislature seriously interfered with local autonomy through its power to pass general laws, and the cases which have reached the higher courts in Minnesota within the eight years just past do not indicate a desire upon the part of the judiciary to restrict the cities, but rather to uphold and extend their powers.[1]

The Colorado scheme is too new (adopted in 1902) for a rule to be fully established. The legislature has the power to pass general laws, but the cities are given " the *exclusive* power " to frame and mend their own charters, which would seem to place Colorado with Missouri and California. Court decisions alone will definitely decide.[2]

As the tendency seems to be to apportion to the State legislature matters of general interest and to the cities matters of local interest, it is important to ascertain if possible just where the line of demarcation is to be drawn. In no State has a principle of general application been established, and the courts have repeatedly said that each case must be decided upon its merits. However, a brief résumé of the decisions in these five States may reveal the general tendency.

[1] See ch. 238 of the Laws of 1903 and *State vs. Zimmerman,* 86 Minn. 353.

[2] The constitutionality of the amendment has been upheld in *State ex rel. vs. Sours,* 31 Cal. 369.

(To be concluded in June)

PORTLAND CEMENT*

Its Uses in Engineering Constructions—Changes of Volume by Variations in Temperature—Continued

By E. Kuichling, C. E.†

In the preceding three numbers of the MUNICIPAL JOURNAL AND ENGINEER, various references to the expansion of cement and other building materials by rise of temperature were made, and as the subject is of much practical interest, it is herewith continued.

RECENT EXPERIMENTS ON EXPANSION OF CONCRETE BY HEAT

The increasing use of Portland cement concrete as a structural material within the past decade, has led to a demand for more definite knowledge of its rate of expansion by rise of temperature. To supply such information, some highly interesting experiments were made in 1901 by Prof. Wm. D. Pence, of Purdue University, Lafayette, Ind., and are reported in *Jrl. West. Soc. of Engrs.* for 1901, vol. 6, p. 549. The scope of this investigation was limited to concrete made of two brands of American Portland cement, Lehigh and Medusa, mixed in the proportions of 1 part cement to 2 parts pit sand and 4 parts ballast. The sand was of good quality, and the ballast consisted of broken limestone in some test pieces, and of pebbles screened from the pit sand in others. To save time in imparting a uniform temperature to the specimens throughout their entire mass, the mixtures were formed into cylindrical bars 4 inches in diameter and 36 inches long, and were presumably allowed to harden in the air, as they were tested a few days after being made.

Each bar was placed in turn vertically, in a cylindrical steam jacket, made of two concentric tubes of sheet-iron, along with an equally long rod of steel or copper, 5/16-inch in diameter and having a known coefficient of expansion, so that in every experiment both bars were subjected to the same changes of temperature. The difference between the elongations of the two bars was measured very ingeniously by using the principle of the optical lever with a 357-fold magnification. On admitting steam of constant pressure into the jacket, observations were made at intervals of 15 minutes until no more changes of length occurred. This usually required from 5 to 6 hours, but the observations were continued for an hour longer to be sure that the concrete bar was heated uniformly throughout. As the temperature of the air in the apparatus rose, the metallic bar elongated quickly, while the concrete expanded very slowly owing to the time required for the heat to penetrate. To compare the behavior of the concrete with that of the ballast, a solid bar of the limestone used for making the concrete bars, and of the same size as the latter, was also subjected to the same treatment.

It was found necessary to dry the specimens thoroughly in the steam jacket in order to eliminate the disturbing influence of variable degrees of moisture, but after they had become entirely dry, the coefficient of expansion remained unchanged on repeating the experiments several times. The interval of time between the first and the later tests was several weeks, but as the process of induration was somewhat modified by the early desiccation of the concrete, the resulting values of the coefficient may not be exactly the same as for material hardening under ordinary conditions. Prof. Pence, however, is of the opinion that the coefficient of expansion of concrete does not change materially with the age of the specimen, especially in view of the close agreement between the coefficient for the concrete and for the stone of which it is so largely composed.

The concrete was mixed with sufficient water to make it rather soft or "wet," so as to represent a mean between the extremes of practice with respect to quantity of water. The usual range of temperature in the tests was about 60° F. Owing to losses of heat by radiation, etc., in the apparatus, the highest temperature noted in the inner air space containing the specimen and metallic rod was about 200° F. The results were as follows:

PENCE'S COEFFICIENTS OF EXPANSION OF PORTLAND CEMENT CONCRETE BY HEAT, PER UNIT OF LENGTH AND 1° F. MIXTURE 1 PART CEMENT, 2 PARTS SAND AND 4 PARTS BALLAST.

BALLAST USED IN CONCRETE.	Name of Portland Cement Used.	Metal bar Used as Standard.	Coefficient of Expansion per 1° F.
Broken Bedford (Ind.) limestone	Lehigh	Steel	0.0000052
" " " "	"	"	0.0000053
" " " "	"	"	0.0000053
" " " "	"	"	0.0000057
" Kankakee (Ill.) "	Medusa	"	0.0000056
" " " "	"	"	0.0000057
" " " "	"	Copper	0.0000054
Average of series with broken stone	.....	.....	0.0000055
Solid bar of Kankakee limestone..	.....	.....	0.0000056
Gravel, screened from pit sand..	Lehigh	Steel	0.0000054
" unscreened	Medusa	"	0.0000055
" "	"	"	0.0000052
" "	"	Copper	0.0000053
Average of series with gravel.....	.....	.....	0.0000054

It will be noticed that the coefficient of thermal expansion of concrete made with broken limestone ballast is very nearly the same as that of the solid bar of the same limestone; and hence it may be inferred that the expansion of concrete made of other varieties of broken stone is not materially different from that of the solid ledge or rock from which the ballast was obtained, since the cement mortar between the ends of the broken stones in the mass of concrete forms only a small part of the entire length.

DISCUSSION OF PROF. PENCE'S PAPER

In the discussion which followed the reading of Prof. Pence's paper, Mr. Geo. Hill stated that the thermal expansion of concrete mixed with a large excess of water would be considerably less than that of similar concrete mixed with only enough water to admit of thoroughly ramming the material; and in support of this assertion, he

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† Engineering Editor, MUNICIPAL JOURNAL AND ENGINEER.

referred to several concrete walls 700 feet long, which had been constructed by him of very wet mixture, and which were subsequently exposed to temperatures ranging from 20° to 105° F., the only effect of the changes of temperature being the formation of three hair cracks thinner than a sheet of paper.

This opinion was opposed by Mr. Von Oven, who considered that transverse cracks would occur more readily in wet than in dry mixtures of concrete. In confirmation he cited the case of the concrete foundation walls of a factory building, 190 feet long and 42 feet wide, recently completed under his supervision. These walls were 15 inches thick and 6 feet deep. In one side and one end wall, the mixture was made quite dry and was well rammed, while in the opposite walls it was made very wet by another foreman. On examining the work some time after its completion, four transverse cracks were found in the long side wall made of the wet mixture, and none appeared in the opposite wall made of the dry mixture.

The same view was also expressed by O. Chanute, C. E., in referring to the interesting work done about 1880 under his direction in lining with beton a number of large stone culverts on the Erie Railway which had become damaged by frost. The best German Portland cement was here used with sand alone, and applied in layers from 3 to 6 inches thick, the mixture being made on the principle of having the cement fill the voids in the sand, and adding only enough water to fill the voids between the particles of cement. Whenever an excess of water was used, fine hair cracks appeared on the surface of the lining, but when the mixture was made as dry as possible and persistently rammed until a small quantity of water was brought to the surface, it stood exposure to variations of temperature perfectly, and has remained sound to the present time.

A number of other engineers likewise concurred in the opinion that only enough water should be used in making concrete to properly moisten the cement, sand and ballast, so that the mixture might be thoroughly rammed into a solid mass. With concrete thus prepared and placed, they had never found any signs of surface cracks. In long concrete walls built in the warm season, however, transverse cracks would usually appear after the setting in of cold weather. To remedy such defects in some cases, the cracks were filled with asphalt, and have since given no further trouble. If the mixture contains a considerable excess of water which cannot escape by direct drainage in the early stages of induration, it must evaporate in course of time, thereby leaving the mass in a porous condition. The quantity of water admissible in the mixture varies with the season, more being tolerable in hot than in cold weather.

T. T. Johnston, C. E., referred to the cracks which had developed in the continuous concrete walls of Sections 14 and 15 of the Chicago Drainage Canal. In Section 14, the walls are about 6,000 feet long on each side of the canal, and exhibit frequent transverse and longitudinal cracks, while in Section 15 the walls made of the same cement and ballast are in much better condition. The effects of the same changes of temperature thus appear to be unlike, and the explanation of the difference in condition must be sought in the workmanship. In large concrete walls built by him several years previously at Joliet, Ill., he did not find cracks due in any considerable degree to changes of temperature or other causes, and in a concrete dam 20 feet high and 5 feet thick, built by him in 1900 in Idaho, no cracks were observed since its completion.

In replying to the discussion, Prof. Pence maintained that his experiments demonstrated that a large change of temperature would be transmitted through a thickness of several inches of concrete in a few hours, and that a change of length (or an equivalent stress) would certainly follow. Experience has shown that transverse cracks must be expected in long walls of masonry when the temperature falls, and this has been recognized in recent practice in constructing concrete retaining walls for railroad work in Chicago and elsewhere, by the provision of distinct transverse joints in such walls at intervals of 50 or 60 feet. These joints are tight in the summer and autumn, but open quite perceptibly in winter. Furthermore, it has been found that in thin walls having such joints at intervals of 60 feet, a crack frequently also appears near the middle of each section, thus indicating that a joint should be made at 30-foot intervals.

Commenting on this discussion, it may be remarked that the quantity of water used in mixing the concrete can have no appreciable effect upon the thermal expansion or contraction of the mass after induration has been completed, as it does not change the physical properties of either the sand or the ballast. The cracks which develop soon after the completion of concrete walls are probably due to the shrinkage resulting from desiccation, independently of changes of temperature, and it has been shown in a preceding chapter that there is a considerable difference in the behavior of different kinds of stone in this regard. Variations in the preparation and subsequent treatment of the material also affect the tensile strength of the mass, and thus lead to inregularities in the appearance of cracks. These points do not appear to have received proper recognition heretofore, and hence considerable space has been devoted to their elucidation.

Attention may also be called to the coefficients of thermal linear expansion of the steel and copper rods used as standards of comparison in Prof. Pence's experiments with bars of concrete. The values of these coefficients are not stated directly in the paper, but in the discussion Prof. Pence mentioned that the usual value of this coefficient for steel was 0.0000065 per unit of length and 1° F., whence it may be inferred that this magnitude was used in his computations. Various other authorities give for the coefficient for steel values ranging from 0.00000594 to 0.00000676; for wrought iron, 0.00000667 to 0.00000686; and for copper, 0.00000913 to 0.00001009. The data obtained at the Watertown Arsenal for these metals were given on p. 160. In view of these variations in value, it becomes desirable to ascertain the exact coefficients of the rods that are used as standards of comparison in such experiments.

Other Experiments

In 1902, the linear thermal expansion of two bars of Portland cement concrete and mortar was determined with great care and the most accurate direct measurements in the laboratory of Columbia University, New York. A brief

account of these experiments is given in Prof. Wm. H. Burr's treatise on "The Elasticity and Resistance of the Materials of Engineering," New York, 1903, pp. 377-8, but the method of making the measurements is not described. The two bars were about 3 feet long, 4 inches wide by 4 inches thick, and 5½ years old. The composition of the concrete was 1 part cement, 3 parts sand and 5 parts gravel, while that of the mortar was 1 part cement and 2 parts sand. The coefficient of expansion per 1° F. for the concrete bar was found to be 0.00000655, and for the mortar 0.00000561. No further particulars concerning the cement, sand and gravel are given.

Similar experiments were also made in 1901 and 1902 in the laboratory of the Worcester (Mass.) Polytechnic Institute, and are briefly reported in vol. 5, pp. 21 and 367, of the *Journal* of the Institute. It is stated that the test specimens were bars of Portland cement of average grade, 39.4 inches long; and as no mention is made of any admixture of sand and ballast, it must be inferred that they consisted of neat cement. To determine the rate of expansion, the bars were placed in water in a copper trough heated underneath by a row of gas flames, and the changes of length were observed by means of two reading microscopes focussed on the point of two needles embedded in the cement near the ends of the bars and projecting out of the water. The temperature of the water was obtained by two thermometers, and observations were made at several different temperatures between 46° and 158° F., each being maintained as nearly constant as possible until the length of the bar ceased to change, whereupon it was assumed that the mass of cement had acquired the same temperature as the water.

The expansion was found to be directly proportional to the increase of temperature in all cases. In two of the bars the coefficient was 0.00000639 per unit of length and 1° F., while in the third bar it was 0.00000567. It is also stated that the possible error in the observations was probably much less than 2 per cent., and that the higher values of the coefficient of expansion over those obtained at Purdue University, may be due to the fact that the concrete test bars used in the latter were dry, while in the Worcester Institute the cement bars were saturated with water. To this statement the remark may be added that the relation between the coefficients of thermal expansion of wet and dry specimens of minerals has not been conclusively established, and that a difference in rate between neat cement and concrete or mortars is to be expected.

In most of the recent voluminous foreign treatises on reinforced concrete, such as those of Christophe, Considère, Berger and Guillerme, De Tedesco and Maurel, and the periodical *Beton und Eisen*, comparatively little space is devoted to the subject now under consideration, and it is generally stated therein that the coefficient of thermal expansion of cement, mortar and concrete is essentially constant for varying mixtures, ranging from 0.00000667 to 0.00000805 per 1° F., with an average of 0.0000075, and being practically the same as the coefficient for mild steel or wrought iron. The references are usually to the experiments of Adie, Bouniceau and Meier, which were made many years ago, and in view of the rapidly growing use of steel in combination with concrete for structural purposes, it is somewhat remarkable that more extensive experimental researches in this direction have not been made with the cements and concretes now in common use.

Summary of Coefficients of Thermal Expansion of Cement, Mortar and Concrete, per 1° F.

On summarizing the various experimental determinations of the coefficients of thermal expansion of cement, mortar and concrete which the writer has been able to find, the following table is obtained:

Coefficient of Linear Thermal Expansion per 1° F.

Author.	Year.	Kind of Cement	Mixture. Parts of Cement.	Sand.	Gravel.	Broken Stone.	Coefficient per 1° F.
Adie	1836	Roman	Neat	0	0	0	0.00000750
Bouniceau	1863	Portland	Neat	0	0	0	0.00000595
"	"	"	1	2	0	0	0.00000656
"	"	"	1	2	Not stated		0.00000794
Meier	——	"	Neat	0	0	0	0.00000678
"	——	"	1	2 to 6	0	0	0.00000678
Keller	1893	"	Neat	0	0	0	0.00000700
"	"	"	1	½	½	0	0.00000611
"	"	"	1	1	1	0	0.00000561
"	"	"	1	2	2	0	0.00000578
"	"	"	1	3	3	0	0.00000511
"	"	"	1	4	4	0	0.00000528
Pence	1901	"	1	2	0	4	0.00000550
"	"	"	1	2	4	0	0.00000540
Columbia Univ.	1902	"	1	2	0	0	0.00000561
"	"	"	1	3	5	0	0.00000655
Worcester Inst.	1901 & 2	"	Neat (?)	—	—	—	0.00000639
"	1902	"	"	—	—	—	0.00000567

From this rather meagre exhibit it would appear that the determinations of Keller and Pence are perhaps the most reliable and useful. Should they be confirmed by new investigations, the assumption will no longer be tenable that the coefficient of thermal expansion of concrete is the same as that of wrought iron or mild steel. It may also be remarked that in making such experiments, the test specimens should preferably be of cement mortar and concrete mixed in the usual proportions instead of neat cement; and that in describing the work done, all details pertaining to character of cement, sand, ballast, mixture, age of specimens and methods of observation should be given, so as to enable others to form a proper estimate of the accuracy and applicability of the results.

Some Instances of Rupture by Thermal Contraction

A number of instances of rupture of masses of masonry and concrete by thermal contraction have already been given on pp. 157-161, and to show that such occurrences are to be expected generally, a few additional cases pertaining to important structures may be cited.

In a long discussion of various high masonry dams in the Institution of Civil Engineers in 1894, *Proc. Inst. C. E.*, vol. 115, Sir Benjamin Baker, C. E., stated that engineers have generally shut their eyes to the matter of expansion and contraction of masonry by changes of temperature. He had kept a bar of concrete 50 feet long, mixed in the proportion of 1 part cement to 6 parts sand and ballast, in a shady place, and had noted its variations of length. These were of such magnitude that if the ends of the bar had been held firmly in place, so as to keep the length constant at every temperature, stresses of 12 tons per square foot (187 lbs. per sq. inch) would have developed in the cross-section; and if the bar had been made of the best masonry, instead of concrete, the stresses due to changes of temper-

ature would have been 50 tons per square foot (778 lbs. per sq. inch).

He also stated that about sixty years ago an interesting experiment was made in the United States by building two thermometers to record the maximum and minimum temperatures in the middle of a wall 5½ feet thick, and leaving them in place for one year. The range of temperature in the interior of this relatively thin wall was thus found to be 20° F., from which it might be inferred that the temperature in the interior of large masses of masonry may be nearly constant, while varying considerably in a depth of 4 to 5 feet from the outside, and hence severe stresses would occur in the surfaces. Applying the results of his experiments with the aforesaid 50-foot concrete bar to the case of a thick mass of concrete 130 feet long, it would be found that the surface layers would tend to expand ⅜-inch more than a layer 6 feet inside. He likewise referred to the great variations in the modulus of elasticity of Portland cement, mortar, concrete and different kinds of stone, all of which have an important bearing on the development of cracks.

In relation to the actual temperatures existing in the interior of large masses of masonry at different seasons of the year, it may be remarked that the valuable experiments of Messrs. J. Waldo Smith and Wm. B. Fuller during 1903 and 1904 on the cyclopean concrete dam at Boonton, N. J., indicate a range of temperature of at least 55° F. at points 2.5 feet beneath the surface, and 32° F. at the middle of a thickness of 45 feet. A brief account of these experiments was given in a previous chapter. (See Municipal Journal and Engineer for September, 1904, Vol. 17, pp. 105-6).

In the same discussion, Prof. P. Forchheimer, of Aachen, referred to the observations of the motion of the crest of the curved masonry dam at Remscheid, Westphalia, due to changes of temperature in the course of the year. This structure has a maximum height of 82 feet, with a bottom thickness of 49.2 feet, and its crest is 13.1 feet thick and 460 feet long, built to a radius of 420 feet. During the unusually hot summer and autumn of 1892, in the course of which the greater part of the storage behind the dam was drawn off, thereby exposing much of the masonry to solar radiation, the maximum movement of the crest upstream was nearly ⅞-inch at a point distant about three-tenths of the length from one end. He estimated that the linear expansion by gradual rise of temperature amounted to ⅝-inch in the entire length of the crest. Now if it be assumed that the extreme range of mean daily temperature between winter and summer was 50° F., and that the said expansion was virtually limited to two-thirds of said length, as more than half of the dam was sheltered by the hillsides from direct exposure to the sun, the mean coefficient of expansion of the massive stone masonry will be 0.0000034 per 1° F.

He also referred to a shrinkage crack in the large concrete dam at Beetaloo in South Australia, described in *Proc. Inst. C. E.* for 1893, vol. 113, pp. 151-167. This dam has a maximum height of 118.5 feet with a bottom width of 115 feet, a top width of 14 feet and a length of 567 feet, curved to a radius of 1414 feet. It is built entirely of concrete, composed mainly of ¾ part Alsen Portland cement, 2 parts washed pit sand and 4 parts broken quartzite rock. Two years were required for its construction, and eighteen months after beginning the work a fine vertical hair crack appeared on June 30, 1890, at a point about 139 feet from the western end. In the course of three days the crack gradually opened to a uniform width of ⅛-inch from top to bottom, after which no further movement was detected. A thorough examination of the concrete, both on the sides of the crack and elsewhere in the work, showed that it was of excellent quality in every respect. The range of mean daily temperature during the period of construction was estimated at about 30° F. by the resident engineer. It is probable that this crack was due rather to shrinkage by desiccation than to change of temperature, although both causes may have contributed to the result.

Reference was also made to the Mouche dam in France, which is a stone masonry structure having a maximum height of 114.8 feet above foundation and 66 feet above the bottom of the stream, a maximum thickness of 66.6 feet on bottom, a top thickness of 11.5 feet, and a length of 1,346 feet. In the winter of 1890-1, when the temperature ranged from 14° to 0° F., and while the water surface was 10.7 feet below its normal level, seven cracks appeared in the dam at intervals of about 160 feet. These cracks were vertical, extending from the top to about 26 feet below the surface of the water, and their aggregate width was 2.875 inches. As the weather grew warmer they closed tightly, thus proving that they were caused wholly by change of temperature. Assuming that the mean temperature of the upper part of this mass of masonry ranged from 15° F. in winter to 65° F. in summer, the mean coefficient of expansion here becomes 0.00000356 per 1° F.

Another interesting case of rupture is described by Henry Ewart, C. E., in a paper on the repairs to the Maligakanda reservoir at Colombo, Ceylon, in *Proc. Inst. C. E.* for 1894, vol. 116. This structure is a covered reservoir having a capacity of 10,800,000 U. S. gallons and built wholly of concrete, composed of 1 part Portland cement, 3 parts clean sand and 3 parts broken gneiss rock. In plan it is square, the sides being 200 feet long, with inner faces vertical and outer faces above ground battered 5 inches per foot. At the bottom the side walls are 15 feet thick, while at the top they are 3 feet thick and have a heavy projecting cornice several feet below. The roof arches and floor are both of concrete 1.0 foot thick. The work was completed and water admitted on September 30, 1885, but no leakage was discovered until 16 days later, when a number of cracks were found in the east side wall and one crack in the floor, the largest of them being ⅛-inch wide.

On repairing these defects no further leakage occurred until December 12, 1886, when the reservoir was emptied and a number of new cracks were found in the floor at the four sides. These were repaired as before, and the leakage ceased until February 16, 1887, when two serious cracks developed in the north and south walls, beginning at the top and extending vertically downward. Within fifteen minutes after appearing at the top, these cracks reached the ground level, water pouring out as they opened. Various other cracks also occurred later. After the reservoir was emptied, the floor was found cracked from north to south,

the fissure being about ½-inch wide at the north and ¼-inch wide at the south wall. The corresponding cracks in the two side walls were ⅝-inch and ⅜-inch wide at the top, respectively. Instrumental observations showed that no subsidence had taken place, and that the fissures were due solely to the thermal contraction of the concrete. Furthermore, while the repairs were in progress, it was noted that small variations in the width of the openings took place which corresponded to changes in the temperature.

It will be noticed that the cracks all occurred at times when both the water in the reservoir and the temperature of the external air were much cooler than in midsummer; and while specific data relating to such temperatures are not given in the paper, it may be assumed that the range in the mean weekly temperatures of the water and air was at least 35° F. Applying this to a mass of concrete 200 feet long exhibiting a contraction of ½-inch, we obtain a coefficient of linear thermal expansion for the concrete = 0.00000595, and if the range is 40° F., the coefficient will have a value of 0.00000521 per 1°F. These figures agree as closely as can be expected with the aforesaid results of direct experiment.

It may also be remarked in this connection, that it is a significant fact that the high masonry dams at Habra, Grands-Cheurfas and Sig, in Algiers, broke in the cold season, and that a crack appeared in the Hamiz dam when the water was first allowed to rise. The reduction of the mean temperature of a mass of masonry must inevitably be followed by a linear contraction or the development of high tensile stresses in the cross-section when the ends are fixed, and if the elasticity of the material is not sufficient, rupture ensues. In the case of the Colombo reservoir, Sir John Fowler, C.E., made use of the results of Baker's experiments with a bar of concrete 50 feet long, as described above, and considered that while the reservoir was empty the side walls were subjected to a tensile stress of at least one-third of the ultimate strength of the concrete, and that the additional stress caused by the pressure of the water when the reservoir was filled was sufficient to cause rupture.

Another interesting case of thermal expansion of concrete is deduced from the description of the Barossa dam in South Australia by Alex. B. Moncrieff, C.E., in *Engineering News* of April 7, 1904, vol. 51, p. 321, supplemented in vol. 52, p. 92. This structure is the highest curved concrete dam in Australia. Its maximum height is 100 feet above rock foundation; its back is vertical, and its greatest bottom thickness is 41 feet, the top thickness being 4.5 feet. The down-stream face is slightly curved for 27.34 feet below the crest, and at this level the masonry is 9.38 feet thick. In the upper 20 feet, two series of nine continuous steel rails weighing 40 pounds per yard were embedded in the concrete about one-third way back from each face as a reinforcement. In plan, the crest is curved to a radius of 200 feet, and has a length of 472.5 feet, with a chord of 370 feet. The concrete was composed of 1 part Alsen Portland cement, 1.5 parts sand, and from 3.9 to 3.7 parts broken stone.

The fabrication of the concrete was begun in August, 1900, and completed in September, 1902. As it was being deposited, large stone were placed in the mass up to within 15 feet of the crest, in the proportion of one cubic yard to six cubic yards of concrete. The total quantity of large stones and concrete was about 18,000 cubic yards. During construction the temperature of the air ranged from 30° to 108° F., and in September, 1903, the reservoir became filled. Careful observations of the movement of the crest since the completion of the work show that with a range of 50° F. mean atmospheric temperature in the course of six days of extremely hot weather following a week of cool weather, the apex of the curved crest moved ⅞-inch upstream, thus giving an elongation of 1.5 inches in the aforesaid length of 472.5 feet. With these data the coefficient of linear thermal expansion of the relatively thin crest of the dam becomes 0.00000529 per 1° F. No mention is made of any cracking in this case.

In *Engineering News* of Dec. 1, 1904, vol. 52, p. 505, Gen. P. C. Hains, of the Engineer Corps, U. S. A., states that some of the Portland cement concrete lock walls on the Coosa river in Georgia, which had been built on solid rock foundations, exhibited after their completion very large transverse cracks at intervals of 60 to 70 feet, thus indicating that the concrete had contracted in length some inches. Unfortunately, no details concerning temperature changes are given in the communication, and hence it must be inferred that the large shrinkage was caused by a combination of the contractions due to desiccation and to reduction of temperature. Taking the former at 0.028 per cent. of the length, as observed in the Boston tunnel (see page 123), and computing the latter with Pence's coefficient of expansion (0.0000055 per 1° F.) for a range of 30° F. in the mean temperature, we will have in a length of 500 feet an aggregate contraction of 2.67 inches, which would correspond to seven cracks ⅜-inch wide each. As the size of the cracks in the said lock walls is not definitely stated, the foregoing computation cannot be checked.

Interesting instances of the contraction of large masses of masonry in cold weather are also afforded by the transverse cracks which have occurred in the new Croton and Boonton dams. During the severe winter of 1903-4, several fissures varying from 1/16 to 3/16-inch in width developed in the upper exposed portions of these structures; but soon after the advent of the warm season, the masonry expanded and all of these cracks closed tightly. Many other cases of expansion and contraction of the concrete foundations of modern street pavements and cement sidewalks might also be cited, but as the range of temperature and exact measurements of the cracks are rarely given, they are of little use in determining the value of the coefficient of thermal expansion.

The same remark likewise applies to the behavior of large stones in buildings. Several times during the coldest portions of the winter of 1904-5, the writer examined closely the exterior of a number of large commercial buildings in New York, and found many instances of cracks ranging from 1/32 to 1/8-inch in the mortar joints at one end of long pieces of granite and sandstone, other similar cracks in the same course usually occurring at intervals of 16 to 30 feet. It thus appears that the integrity of masonry structures is considerably affected by the changes of length due to variations of temperature, and that the subject merits far more attention than it has hitherto received.

(*To be continued.*)

FILLERS FOR BRICK AND BLOCK STREETS*

The Views of an Expert on the Advantages and Disadvantages of the Different Kinds of Fillers for Pavements—Merits of Asphaltum

By B. H. C. Ennes, C. E.

In municipal construction, one very important division is that of the street department. Seemingly every individual has some method of making the very best street on earth. Every street constructed or reconstructed by any of the accepted paving materials, has a score of interested property owner inspectors. No doubt many of you have stood on the curb and listened to suggestions from the observers which carried some food for thought and reflection as to possible better methods of construction.

How to Better Brick and Block Streets

If we can build and please those who make use of our streets, at the same time those who may be affected by the payment for the improvement, then we have an endorsement from a very effective source.

In the effort to secure advancement in the methods of bettering the surfaces of our brick and block streets, it is the object of this paper to consider a stage in the construction, which may not have received the attention it should. I refer to the joints between each brick laid. This is practically the last stage in the construction of the roadway, except the cleaning up, and should be given the same consideration as any other part, lest by shifting the responsibility from one part to another, principally to the brick, we may not secure the successful results we had hoped for. As an illustration of this example I may cite, that, in the construction of concrete, we oftimes pay more attention to the brand of Portland or natural cement we use than to the other ingredients. Sometimes failures occur and almost invariably the cement must shoulder the blame. The stone and sand being the factors of the largest proportion should receive the same ratio of attention. If not it is rather hard on the cement, don't you think?

We are all familiar with the two-course brick roadways and sand filled joints; also the next step of placing the brick on a sand cushion and concrete foundation. Seemingly, the best results were secured by the firm concrete base; hence to-day that is the accepted construction standard. Often brick roadways are laid upon gravel or crushed stone bases, or upon an old macadam road trimmed down to the proper contour, with favorable results.

To secure good results much depends upon the method of construction, the specifications as drawn by the city engineer; the workmanship and a high standard of quality of the material specified and used.

Having performed the several stages of the work, securing good concrete of the required thickness and laid the brick on the sand cushion, the surface rolled to an even contour, we are now to the last stage of filling the joints and completing the contract.

What Kind of a Filler Shall Be Used

Now, what shall the filler be? Which will secure us favorable results and which will give the best proportion when worked out in a series of ways. Shall we use sand, cement grout, tar or pitch, sand and tar, or an asphalt filler? Let us make a selection for results. Sand is, no doubt, the cheapest, both in cost of the material and in the placing it in the joints. When this is said, perhaps all has been said that is favorable. It affords no prevention against filth lodging in the interstices, is entirely unsanitary, readily washes out and into sewers, and permits street dirt to work into the joints. It increases the cost of cleaning the streets and sewers, so why pay out something for an undesirable material and again pay to remove it from the sewers. It affords no protection to the edges of the brick, permits the edges to be chipped by the shoe of the horses greatly to the disadvantage of travel and ease of traction. It creates a pervious instead of an impervious surface, the brick being practically so, hence opportunities for freeze and thaw, and to injure the base as well as the surface. It is not a factor which can be realied on in case of emergency. It has only the first cost to commend it with a very great inequality sign opposite. Sand should not be used in this construction. It is excellent for other purposes, such as that of making a cushion for the brick to rest upon and in the making of the concrete base. When it has suitably been used for these purposes I think we have asked all we should of one material in the general construction.

* The above paper was prepared and read by H. C. Innes, C. E., of Cincinnati, O., before the recent meeting of the National Brick Makers Association at Birmingham, Ala.—[Editor.

Cement Grout Better Than Sand

An improvement over the sand filler, seemingly, is the cement grout often used for this purpose. It is composed of Portland cement and sand in various proportions mixed with considerable water and spread over the brick surface and broomed into the interstices. Its cost is reasonable, depending upon the prices paid for cement and sand. The item of labor mixing is low. There is a tendency where so much water is used for the cement and sand to separate, thus not getting a uniform consistency throughout an entire batch. This class of filler is more expensive than sand. After brooming into the joints time should be given to permit the mass to set before travel has been turned into the street, when it adheres to the brick and becomes a solid, rigid street covering. It prevents any seepage to the under soil or concrete base, in this respect it gives sanitary conditions favorable. There is a possibility of the sand cushion beneath the brick taking up some of the cream of the grout when it is poured or slushed on the pavement. If such is the case our filler is weakened, the cushion in part being converted from sand into a weak mortar, which removes its effectiveness as a cushion. Should it become necessary to enter the roadway for some connection, it is difficult to replace the old brick owing to the mortar adhering, necessitating the chipping, consuming time and possibly some brick. Cement grout filler when set is hard, firmly uniting the brick into a solid surface, prevents the chipping of the edges and the street accumulation from entering the joints. Being hard it is also an excellent conductor of sound, and adds to the foremost objection to the paving material itself, namely, noisiness. Were the filler of an elastic nature this quality would greatly reduce the sound vibrations and tend to give better results, by minimizing the one serious objection oftimes raised. As with the sand filler mentioned, we find good use can be made with the cement in the concrete foundation to insure firmness for the wearing surface. When it has performed this requirement successfully it surely does much to the success of the pavement, in giving an unyielding archway of concrete, protecting against settlement of the surface.

What Is the Ideal Filler?

An ideal filler should possess qualities truly essential for the best results. Not alone for itself, but readily advance benefits to other materials used in connection therewith. It should be the outgrowth of experience extending over periods of observation, to afford betterments, obliterating objections, and produce at the present time the best material for the purpose intended. It is incumbent upon future experience to possibly discover something better.

I would place, as the first requisite for a filler in brick or block streets, that it should be sanitary and noiseless, to give comfort. In our estimate of dollars and cents, we cannot, or do not place a monetary value upon the item of comfort. We can readily estimate the cost of a street having the price of material and labor given, but doubtless seldom does the item of comfort enter into the equation.

Secondly, the filler should be, I believe, elastic, pliable and not rigid. This being essential to permit of expansion and contraction, to avoid, if possible, the buckling of surfaces or the giving of pervious joints. The surface being jointed, it is inteded to promptly adjust itself to unlooked for conditions. To guard against any and all objectionable conditions unforeseen.

Third. It may be well to consider the item of maintenance and the re-use of material taken from the street for cuts, occasioned by conduits or connections. Cement once set is valueless for use again and must be wasted, while asphaltum can be again used in the same manner by reheating. Brick are easily cleaned where the latter material is used, but somewhat difficult in the case of grout.

Fourth. The weakest part of a brick or block is its edge and unless protected and supported soon wears rounded by the action of wheels and horses shoes. Grout, if it can be placed in the joint so as to completely fill same, meets these requirements when set, but requiring, as it does, some time to secure the initial and final set, and considering the contour of the street, it has a tendency to flow towards the gutter, the lowest place, leaving some of the joints only partially filled.

The asphalt filler having greater density and viscousity, tends to fill the joints somewhat better and if not completely full, any additional material added readily unites with that previously poured. It also protects the edges of the brick completely judging from surfaces examined where this class of material has been used.

Fifth. In this, the last item I would place the first cost and the final cost. If the first cost is low there must be some reason, if high, considering, equally another reason. In some instances low costs and results may make an equation; again, it may be low first cost plus high final cost which gives an article entirely satisfactory plus low maintenance costs produces results, giving increased use and durability, coupled with advantages through satisfaction and contentment in final costs.

An Asphaltum Filler the Best

Concluding, then, that an asphaltum filler is the best and should be the material used in the filling of joints in brick or block pavements, it should possess the qualifications which will give the results sought. The filler should analyze about 100.0 bitumen for the best results. It should be unaffected by water or street liquids, should be easily handled and placed in the joints at as low cost as possible, should be so tempered as to meet weather conditions or sudden changes. It must not be too soft in summer or brittle in winter. Disintegration must not take place. It should have been tested in street paving as a filler for some years to prove its worth before adopting same. A filler meeting such requirements would give good results and could be relied upon for service.

The writer has used asphaltum cement filler in connection with brick, Scoria block, Medina block, granite block, Hayden block, etc., with results highly satisfactory. Resulting conditions, observed, warrant the statement, if for no other reason than that the noise was greatly reduced and

where settlements occurred showed the joints waterproof and closed. Cement grout was also used in many instances, but the best results, seemingly, were obtained from the asphalt filler.

Attention is called to the filler produced from asphalt, which is rapidly displacing other materials formerly considered in this particular. Many claims of merit presented have been verified by practical tests. Observations of a brick street carefully laid upon a good concrete foundation of sufficient thickness, using the proper sand cushion, a well made vitrified brick and the joints filled flush with an asphaltum filler, produce results which are very gratifying. The object of the filler being to prevent seepage from the surface to the foundation; closing perfectly the interstices against lodgment of germs, the breeders of disease; to afford and give protection to the brick or block against chipping caused by the horse's shoe; to prevent that grinding due to heavily loaded wagons in passing over the surface, theoretically spanning the joint, yet practically tending to grind for an instant the edge unless protected. An important advantage of the asphalt filler over the cement grout is the great reduction of the noise. It has the additional advantage of shaping itself as conditions may make necessary, in case of a settling of the foundation, as oftimes occurs, the surface also must settle with it; when it does the asphalt filler assumes readily its new condition, yet fills the joints completely and prevents the lodgment of filth.

The rumbling sound often heard coming from a brick pavement street may be produced by the foundation and sand cushion separating from the brick surface (which is an arch firmly keyed where cement grout filler is used). This could not result if the joint was filled with a flexible asphalt filler because, when the separation of the foundation and cushion took place, the surface by its own weight and the passage of vehicles would tend to place the brick surface again directly upon the foundation, avoiding the space otherwise produced. The theory of concrete contracting during the process of setting and after the surface has been laid, producing the rumbling sound given from a brick street where the joints are filled with cement grout is well founded. Yet where such joints are filled with an asphalt filler, plastic in nature, this would not result for the reason given above.

Buckling of Brick Streets

We have read of brick streets buckling and bulging under the hot summer's sun until the limit was reached, then exploding with a loud report. Such surfaces are filled with grout. Brick and cement mortar will expand with heat, especially when the heat is continued for some time. Were the asphalt filler used, the expansion would continue just the same, but the buckling and bulging would not, because, being flexible and plastic, under that same temperature it would assume the conditions imposed upon it, thus adjusting itself to the expansion of the brick. In the case of contraction during cold weather, there would be a tendency for the adhesion of the grout to be broken, which would produce undesirable results. This would not occur with the asphalt filler, especially where the filler retains its flexibility to a low degree of temperature. As before, it would shape itself to meet the new condition imposed, the result being a closed joint, impervious, and a poor conductor of sound.

How to Use the Asphaltum Filler

For some years an asphaltum filler has been in use in connection with brick and block street paving material. Good reports come from those cities using it and city engineers speak well of its qualities. This filler is prepared in Chicago by the American Asphaltum and Rubber Co., of that city. The component parts being approximately 68% petroleum and 31% asphaltum or 99% plus pure bitumen. The melting point being about 210 F. and used at a high temperature in actual work, perhaps 400 F. A gallon weighs approximately 7.5 to 8 pounds or 250 gallons to the ton of 2,000 pounds. It has been tested by actual service for some years, both as a filler and for expansion joints and reported on very favorably.

In constructing a brick street using this filler, portable asphalt or pitch wagons or kettles are used to heat the material. In order to expedite the melting and pouring at least two such kettles should be used to avoid delay in waiting for material to melt. It should not be used until it is thoroughly melted and flows readily. In pouring and filling the joints, conical pouring pots are used, a wire passing through the apex operated by the workmen so as to permit the filler to run into the joints or stop the flow as may be desired. The use of such pourers in the hands of a careful man will save wasting material at the same time better and more completely filling the joint. Approximately, one gallon is required to one square yard of paving brick, paving block, somewhat larger than the brick, taking less.

One advantage to the general public, in the use of a filler of this class, is that the continued inconvenience of having a street blocked for three or four days to permit the filler to set or harden is reduced. Grout requires this time. As soon as the joints are filled a light sweeping of sand can be placed on the surface and the street opened for travel. When once in the joints there it remains until disturbed for some underground work. Upon completion we have a surface composed of hard vitrified paving brick surrounded on all sides by a thin section of elastic, non-conductor of sound, waterproof material.

In summing up the subject it would be the object, mainly to create a desire for improvement in the construction of streets. Brick being one of the paving materials largely used, which has advantages and disadvantages, it should be the aim to reduce the objections and increase the advantages all that is possible. In so doing we assist a large community to the enjoyment of better thoroughfares. The subject of a proper filler for brick or block streets is one which has had some consideration, but possibly not as much as it is really entitled to receive at the hands of producers of brick and city authorities. Examination of different fillers now in use, in various cities, duly reported, tabulated and fully considered should be productive of results beneficial to all interested in the advancement of better methods of construction. Let us ascertain if comfort and benefits are not factors worth considering in making up an estimate for the cost per square yard of paving.

MAYOR DUNNE OF CHICAGO

A Practical Idealist, He Has Undertaken a Large Task—How He Proposes to Achieve Results

WHEN Judge Edward F. Dunne was chosen mayor of Chicago it was a practical victory for municipal ownership of all public utilities, especially of the street railway systems. But the election fight is the small end of the problem. It is just the beginning of the real fight for civic supremacy over private monopoly. But it is generally conceded that Judge Dunne is the right man for the work. That he appreciates the difficulties in the way and that he is a wise leader is indicated in all his public utterances and especially when, upon the announcement of his election, he sent the following cablegram to the Lord Provost of Glasgow:

"Chicago, as the first great city in America, following the lead of Glasgow and other progressive European cities, has declared for the municipalization of its street cars by 25,000 majority. Will you give the manager of your municipal tramways a vacation of thirty days to visit Chicago to confer with me? all expenses will be paid by me."

To which the city of Glasgow has replied that it will gladly let its street railway manager, Mr. Dalrymple, go to Chicago. He is expected to arrive in Chicago by the middle of May.

On April 8th Mayor Dunne came to New York and delivered an address before the Municipal Ownership League of New York City, and so we will let him tell the story in his own words:

"Men of the East: We bring you tidings of great joy from the men of the West. The exploitation of public property by private capital, with its attendant greed, extortion and corruption, has had its day in American cities, but that day is about to end. Next Monday Chicago starts upon her mission of dislodging private capital from the control of our street car system.

"You men of New York may surpass us in wealth, and, it may be, in culture, but Chicago, in our judgment, is the nerve center of American and the leader in economic thought and action. Chicago is the only city in America that has declared by an overwhelming majority in favor of the municipalization of her street car system, and what Chicago wills she does.

"It may be wise for me to discuss briefly before you citizens of New York the only two serious objections raised during the recent struggle in Chicago against public ownership and operation of the public utilities:

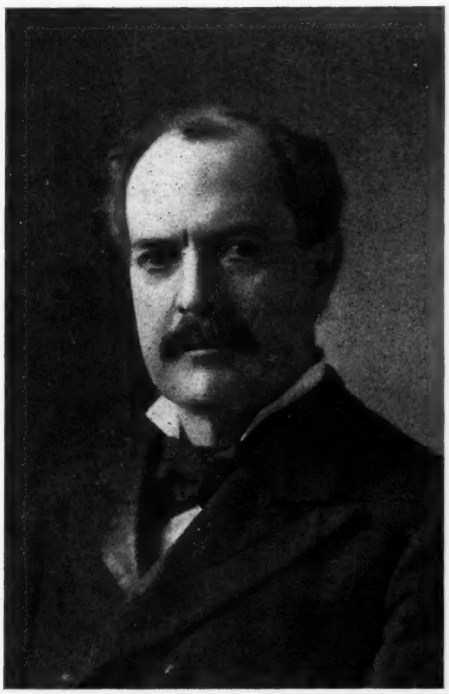


Photo by Wallinger

EDWARD F. DUNNE
Mayor of Chicago

"First, that it would tend to build up a great political machine. None of the friends of municipal ownership in Chicago or elsewhere advocates the ownership and operation of any utility by municipalities unless in connection therewith there is a civil service law under which all applicants for position, irrespective of their politics, will be treated exactly alike and under which just and reasonable tests will be applied to public servants to ascertain their fitness to perform the work entailed upon them. We have such a law in the city of Chicago, under which, for several years past, it has been practically impossible for any man to place a friend upon the Police Department, Fire Department or Water Department. Where a public utility is controlled by private capital in the city of Chicago, any Alderman who votes "right" has an unlimited field in which he can anchor his political henchmen.

"The only other serious objection urged in Chicago against the operation by the public of its own utilities was that the municipality had no money. There is no force whatever in the objection. The operation of these utilities, either by public or private persons, is a valuable privilege.

"We in Chicago propose to raise all the money necessary to purchase an up to date street car system upon certificates which are special or limited promises to pay out of the income collected from the system. They are not general promises to pay which will entail taxation. Under the law of the State of Illinois these certificates are termed street car certificates. They should more properly be called income bonds. They are secured under our law in three ways: First, by the pledge of all of the income of the municipal street railway plant; secondly, by a mortgage which conveys all of the tangible property in the transportation department of the city; thirdly, by a twenty year franchise; in other words, there is a provision in the law under which, if default be made in the payment of street car certificates, or of interest thereon, for the period of one year, then and in that case the holders of the certificates may apply to a Court of Chancery to foreclose all of the tangible property used by the city in its transportation department, and at the foreclosure sale there shall be knocked down to the bidder the franchise commencing to run upon the date when the purchaser buys the property, and running twenty years there-

after. This security, in my udgment, is much better security than the private companies in the past have been able to offer, either to their stock or bond holders.

"The operation of public utilities by municipalities is no untried theory. It is in practical operation, as to street cars, in 146 great cities in Great Britain, in Berlin, in Vienna, in Budapest, in Paris, in the cities of Belgium and Switzerland, and in the cities of Australasia. Where it has been put in operation with reference to street cars it has brought about these results: First, the reduction of the street railway fares; secondly, the increase of the wages paid to the laborers employed in the department; thirdly, the reduction of working hours; fourthly, in increased efficiency in the service accorded to the public; fifthly, the abolition of strikes.

"The movement in favor of municipal ownership of all public utilities has taken deep root among the intelligent people of this country. It is no passing sentiment. It is here to stay. Municipal ownership and operation of these utilities and governmental ownership of the railroads, telegraphs and express transportation is a practical question upon which the people must pass within a very short time, and the politicians and parties who ignore this sentiment must be prepared for a short lived career before the people.

We in Chicago have no fear as to the results of municipal ownership. We are confident that the will of the people can be carried into effect, and that, too, without the imposition of a single dollar's worth of taxes; and we say to you men of New York that you can, by the exercise of the same determination, bring about municipal ownership in your city of any public utility that you may desire furnished by the people of your city without an increase of taxation upon your citizens."

ELECTRICAL THAWING OF WATER PIPES*

Different Methods Employed in Thawing Frozen Water Mains in Various Parts of the United States

By George S. Haley

As to the method of procedure to thaw with electric current, assuming an alternating current of one or two thousand volts is available, the necessary requisites are as follows:

1. A transformer of 10 or 15-kilowatt capacity with 50 and 100-volt secondary; for ordinary house services 50 volts is sufficient.

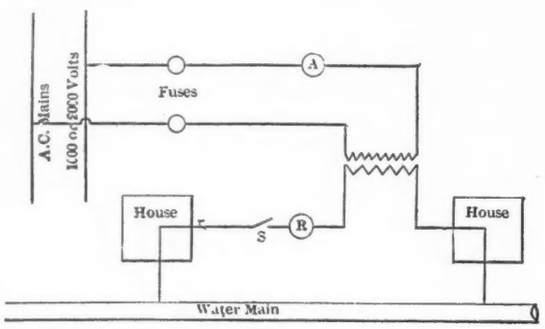


Fig. 1.

2. An ammeter reading to 30 amperes if placed in the primary.

3. Primary cutouts.

4. Single-pole switch in secondary.

5. A resistance that can be made, as described below.

Connect up instrument, as shown in Fig. 1, leaving the movable electrode out of the water. Close the primary switch and drop the lower end of the electrode into the water, watching the ammeter, which should indicate 3 to 5 amperes and which will increase as the electrode is given more contact with the water; the maximum amount of current will depend on the resistance of the pipe. The most practical arrangement, aside from a transformer made for the purpose, is shown in Fig. 2.

A choke coil, made as described below, and placed between the primary switch and the transformer, gives practically the same results and is much more efficient and easier handled.

Before closing the secondary switch, the position of the core of the choke coil should be noted. It should be completely inside the choke coil, and to increase the secondary current, withdraw it until the required amperes are obtained.

Figure 1 shows two house services being thawed at the same time, one end of each secondary being attached to the sillcock of each house, the resistance *R* being placed in the secondary circuit. Ammeter *A* indicates the number of amperes in the primary circuit. The transformer should be protected by suitable fuses, located either upon the pole adjacent to the primary feeders or upon the wagon.

Figure 2 shows one house service being thawed and connected to one side of the secondary feeder, the other being connected to hydrant *H*. In the diagram, *A* represents the ammeter in the primary circuit, *M* a recording wattmeter in the secondary, and *V* a voltmeter across the secondary terminals of the transformer.

Figure 3 shows a connection for the use of 104 to 125 volts, alternating or direct current. This arrangement is applicable to isolated plants using two or three-wire low-voltage distribution. *A* indicates the ammeter and *R* the resistance.

Figure 4 shows the simplest outfit possible; a 10-kilowatt transformer connected for 104 volts, an ammeter and switch in the secondary, and fuse boxes in the primary either on the wagon or on the pole near the point of connection to the primary feeders. While the outfit will do the work, I would advise by all means the use of a resistance of some kind in order to control the quantity of current at the start.

* From a report compiled by George S. Haley for the National Electric Light Association, and published by the Association at New York.—[EDITOR.

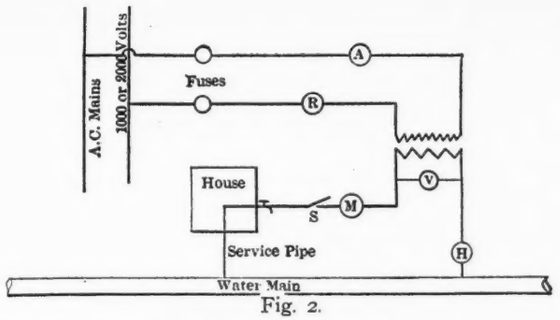


Fig. 2.

In an outfit used at Gloversville, N. Y., a simple rack is built upon the body of a sled upon which are placed the primary cutouts. The primary wires are dropped from the pole to the top of this frame work, then to the cutouts. The current is measured by the wattmeter, which is connected in the secondary circuit. Standard transformers are used, which give a sufficient range of voltage. The wires used for primaries and secondaries are mounted upon reels in a convenient manner for easy handling. For a clean and effective outfit, this seems to be the most practical that has been suggested.

A choke coil suitable to control for all purposes a 15 or 20-kilowatt transformer with 2,000 volts primary is constructed as follows:

A tube 16 inches long, 2 inches in diameter, made by winding a sheet of one-sixteenth inch red fiber around an iron mandrel four times and held in place by a few small tacks; two wooden beads are provided, six inches in diameter by three-quarters of an inch thick, and secured to the ends of the fiber tube. A winding consisting of 200 turns of No. 12 weatherproof wire is placed on the spool after it has been given several coats of shellac and dried. A core is made of No. 14 iron wire in pieces 16 inches long, held together by a few turns of fine iron wire and covered by two layers of tape. The center wires are cut four inches longer, and over them is placed a wooden handle.

The simplest form of rheostat suitable for either primary or secondary, but recommended for secondary sides only, because of safety to those using it, consists of a barrel of water to which 10 pounds of common salt has been added, with two electrodes, each made of a coil of 10 feet of No. 2 bare copper wire in a flat spiral, or a six-inch pipe flange, one fastened to the side of the barrel near the bottom, the other so arranged that it can be raised or lowered. This form of resistance has been used by the majority of those who have thawed pipes by electric current, probably because it was the easiest obtained; and while not strictly up to date, electrically speaking, it certainly answers the purpose.

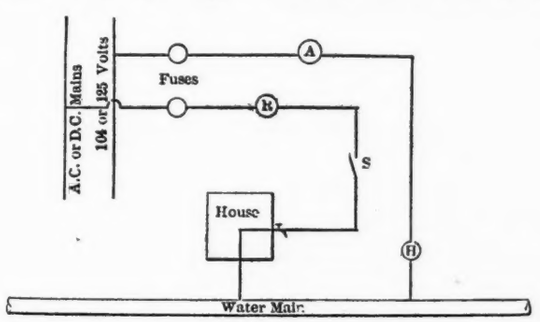


Fig. 3.

A rheostat of this description will handle 300 amperes for a short time; if continued, the water will probobly boil over.

An outfit used in Durango, Col., is the most complete in detail of any that have come to our notice. Four small transformers, taken from the scrap pile with 55-volt secondaries, were placed in the wagon in front of the switchboard. In the secondary of each transformer is placed a choke coil, described as follows:

The choke coils are about 18 inches long with a core 2.5 inches in diameter, formed on a brass tube with cast ends, a slot being cut lengthwise through the tube and ends to prevent the formation of a closed secondary circuit in the spool. After being thoroughly insulated, each core is wound with two layers of No. 4 magnet wire. The cores, which are 18 inches long, consist of 500 pieces of No. 14 annealed iron wire, which are assembled around a central iron rod, threaded at each end, with two fiber heads turned to fit the tube. The whole core is covered with several layers of cotton tape, coated with insulating varnish. Above each choke coil is placed a 75-amp. double pole knife switch and a 100-amp. double-pole D. & W. cutout; also one 350-ampere ammeter and one 150-volt voltmeter. There are also four pilot lamps,

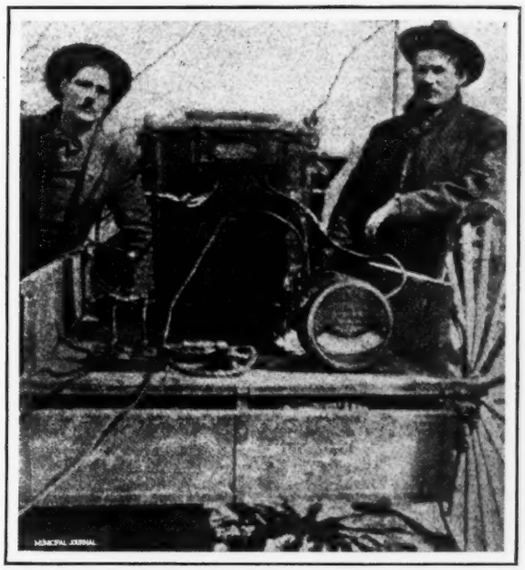


Fig. 4.

one of each being connected to the four transformers, which by the switches mentioned can be thrown in multiple. On the back of the wagon cover are placed two G. E. primary cutouts, and just back of these is a 30-ampere double-pole. quick-break knife switch, placed in the primary circuit. The secondary leads are composed of No. 00 cable wire with connectors made of brass, to facilitate the connections of the pipe system. To use this outfit the primaries are brought from the pole to the cutouts. The secondary connections are made to two houses, or one house and a hydrant. The primaries and secondaries are then closed and the cores pulled out of the choke coil until the desired amount of current is obtained.

In compiling the report, replies to a series of questions were received from about two hundred central stations in the northern part of the United States and in Canada. Abstracts of a number of these replies are given in the report, and from these we quote the following:

At least seventy-five electric light and power companies have employed the electric method of thawing frozen pipes. In the majority of cases the superintendent of the water-works requested this work done. Those that did not make any attempt were either not asked to do it, or did not consider it worth while to equip an outfit for this work. It is worthy of note that almost without exception those who have not already made the attempt now want all the information they can get, evidently just realizing that there is something in it. In the majority of cases the work was paid for by the residents or consumers, although in a great many instances it was paid for by the water-works company.

Very few correspondents seem to have taken the trouble to make accurate measurements of the current. Usually an ammeter was placed in the primary, in order that the transformers might not be overlooked to such an extent as to cause them to be damaged. A few used both an ammeter and a voltmeter, from which readings were kept and current figured on a volt-ampere basis.

A correspondent states, as follows, in reference to the measurement of current: "We find that the water always begins to flow before the lead pipe shows an appreciable heating. We intend, therefore, to dispense entirely with ammeters and instead to make use of the temperature of a piece of lead pipe filled with water, which will be inserted in the low-voltage circuit at the switch. Should the amperes in any particular case be twice as much as is needed—say 400 amperes instead of 200 amperes—I believe the only effect will be to shorten the time needed for melting the ice and starting the flow of water. The frozen pipe surrounded by earth at a temperature less than 32 degrees Fahrenheit, can be regarded as a reservoir for heat, in which a certain quantity of heat must be generated and stored before melting takes place. If this heat is stored in half the time, the same temperature approximately will be attained in each case and it therefore makes no difference whether or not the current is increased abnormally, provided the time is correspondingly shortened. The only danger in passing an abnormally large current through the water pipe is when the excessive current is kept on until the pipe reaches a steady temperature, and the lead-pipe temperature indicator mentioned above will be an absolute measure of this."

All voltages from 2.5 to 500 seem to have been used. Only a few answers indicate that elaborate tests have been made. The majority of the work has been done, apparently, with little regard to the current consumption, the price charged being high enough to make up for any deficiency in this respect. From one correspondent we have the following:

"A length of 40 feet of one-half inch lead pipe required 186 amperes at 12 volts applied for five minutes.

"For a length of 20 feet of half-inch extra heavy lead pipe, 10 volts was required to force 150 amperes through, and from 12 to 15 volts for 200 amperes. With a current of 200 amperes, the water was started in three minutes, but it was found necessary to raise the current to 281 amperes with a voltage of 18 applied for 15 minutes. By this time the pipe was quite warm, the temperature being about 115 degrees Fahrenheit, which proved that there was no longer any ice in the pipe and that the flow of water was obstructed by other causes. One hundred feet of half-inch lead pipe required a pressure of 37 volts to force 270 amperes through; time required, five minutes. In this case the current passed through 100 feet of water main. The actual kilowatts in this case were 7.5, which, for the space of five minutes, represents 0.62 kilowatt-hour. Another case of 60 feet of half-inch lead pipe in circuit with 60 feet of water main required 200 amperes at a voltage of ten for twenty minutes to free the pipe. The current consumption in this case was about 0.70 kilowatt-hour. One hundred feet of small service pipe, supposed to be of iron, required 200 amperes at 25 volts for five minutes; the current consumption being about 0.33 kilowatt-hour."

A correspondent writes: "In one instance a street service was thawed, using storage batteries; the pressure was 2.12 volts, the amount of current used was not given." He stated further that the safe maximum current that can be carried by a one-inch lead pipe is 300 amperes.

The alternating current seems to be used almost universally for this work, and in only one or two instances has the direct current been used. A correspondent states that in the use of direct current, he found that the energy would all be expended at or near the positive connection of the pipe, he having noticed that the ice had melted and the water boiled in the pipe at the positive connection while at the negative connection, three feet away, there was no indication of heat whatever. He stated further that the alternating current was much more effective than the direct current, and that he could accomplish more with less than one-half the amperes of alternating current. In one instance he applied from 400 to 480 amperes at 104 volts direct-current to a 2-inch water main for six hours the first day, and eight hours the next, making no impression whatever. After four or five days of very cold weather, he applied 150 amperes of the alternating current and thawed it out in about three hours.

Referring to that portion in which the correspondent states that in the use of direct current he finds the energy would all be expended at or near the positive connection, etc.—this seems hardly possible and might be due to several reasons; for instance, poor connection at the positive end, the pipe being exposed to the air only while the other end of the pipe might have been buried in the frost, or near some other substance that could rapidly conduct away the heat.

The water rheostat seems to have been used by about 90 per cent. of those who have used this method of thawing pipes, because it was so easily obtained. In the majority of cases the work came upon all of us very unexpectedly, and it was a question of how quickly we could get ready, and not how complete an outfit we could devise for the purpose. In only a few instances has the water rheostat been used in the primary side. As a matter of safety, this would not seem advisable. Almost everything has been used for electrodes, from copper wire to railroad fish plates. Any metal with a sufficient area will answer the purpose. In a few instances choke coils have been used in the primaries of standard transformers, and in a small number of cases, no method whatever was used for controlling the current.

One correspondent writes that he is operating a two-

wire, 110-volt direct-current plant, which does not give any day service. To thaw service pipes, he connects one side of his system to the water main at his station. He then connects the other side of his circuit to the house service, having previously arranged with the engineer at the station to give the required amperes on the station ammeter. From a point of labor, this is probably the simplest of thawing water pipes that has been used, but as the majority of central stations operate twenty-four hours in the day, this plan would not be applicable.

Transformers of all descriptions were used. In many cases they were taken from scrap piles, and put to good use thawing pipes. The secondary voltage seems about equally divided between 50 and 100 volts; evidently because the standard transformers were used and 50 volts in some instances not found enough, 100 was used, as it covered all cases, regardless, however, of current consumption. In thawing lengths of from 100 to 200 feet of service pipes or of mains, the opinion seems to be that from 75 to 100 volts are necessary at times. The average capacity of transformers used is about 15 kilowatts.

In reference to the purchase of a special transformer for this work, but few correspondents indicate that they would go to this expense. The majority think that the standard transformers are thoroughly practical, and that they have the advantage of being useful upon other work.

Special attachments for connecting wires to faucets or mains seem to be used in only a few instances, the ordinary method being to wrap about 12 inches of the bare wire, used for the secondary, around the faucet or main. Regarding the handling of primary feeders, the majority of operators were particular to have them insulated, while a number allowed them to lie on the ground without special care other than to keep pedestrains and teams away from them.

But very little damage seems to have been done to pipes in general from this method of thawing. In a few instances, where the water did not start to flow through, the pipes being clogged, the lead pipes were melted off at the faucets.

The opinion of the correspondents is that the work is not hazardous if capable linemen are employed in the work.

The report contains two tables giving details of the kind of work done by the correspondents, with all available information, such as size and kind of pipe or main, current and time consumed, basis of charge for the work, etc. A few instances of the thawing of gas pipes are also recorded in the report.

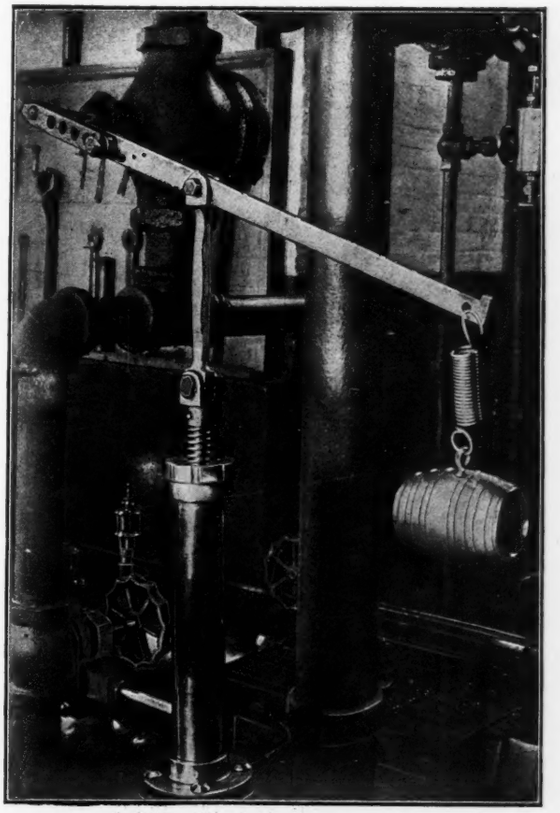
THE AIR LIFT SYSTEM OF PUMPING

How a Business Concern Overcame Difficulties in Getting Its Water Supply—Up-to-date Appliances Used

EFFICIENCY and economy should be the watchwords of every successful municipal water plant. In most American cities too little attention is given to the prevention of water waste. This is not due to the carelessness or incompetence of the superintendent of water-works, but rather a necessary concession made by him to the incistent clamor of the public for all the water it wishes to use, whether in a wasteful or economical manner. The public has not yet awakened to the idea that municipal water is not free, nor that it can be wasted with impunity. The time is not far distant, however, when the thoughtless public will receive a sudden jolt, bringing it to its senses. This will occur when a water famine becomes imminent, as has already been the case in many municipalities, large and small.

The municipalities of New England are among the most progressive and economical in the operation of their water plants, for they not only endeavor to produce the water at the least possible expense per thousand gallons, but also exercise great care to see that it is not needlessly wasted by the consumer. By careful methods, most New England cities have succeeded in reducing the per capita consumption to less than seventy-five gallons, which is almost an unheard of standard in most other sections of the country. This result has been achieved very largely by the use of meters, and careful inspection of all service pipes.

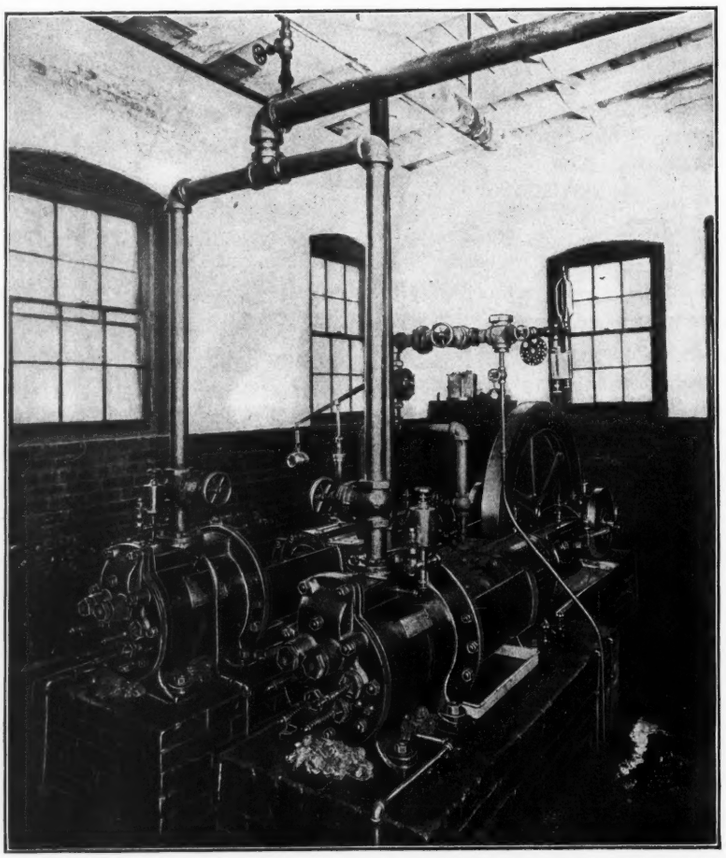
First in importance in the equipment of a water system, economy of production should be considered. A business



"AUTOMATIC AIR REGULATOR"

corporation is careful to count the cost in advance, and it is generally safe to follow the practice of business corporations in this particular. If the administrative officials of a water department, whether in a large city or a small town, were permitted to adopt business methods more generally, there would be less complaint about the management of municipal plants. Politics too often determines who shall be superintendent and who shall be his subordinates, even to the man who shovels gravel or digs a trench.

The readers of THE MUNICIPAL JOURNAL will be interested in the description of a small pumping plant installed in a large brewery in Newark, N. J. This consisted in the installation of what is known as the "Air Lift System of Pumping," which supplanted the deep well pumps in 1897, and which has yielded since 125 gallon of water per minute from one well, as against sixty to sixty-five gallons per minute by the old way (180,000 gallons every twenty-four hours).



RAND COMPRESSOR IN TEEFZ BREWERY, NEWARK, N. J.

It is a significant fact that since the Pneumatic Engineering Company finished the contract in '97 there have been absolutely no repairs to the pump itself, the only worn parts in the entire system being springs on the air cylinder and the outlet valves of the compressor.

The fact that there is no mechanism in the well itself is sufficient guarantee that it is no longer a requisite to use five or six men to haul out from twenty to thirty connecting pieces and pipes for some irksome repair, while the water supply of the entire plant is crippled until the damaged machinery can be adjusted.

In this case the friction and action of the old-style rods caused constant breaks, and the pipes were continually wearing out, so that it was a case of uncoupling each piece of pipe as it was pulled to the surface and substituting new pieces when the damaged part had been located. This was not a matter of rare occurrence, but a condition which could be anticipated and safely relied on to happen every few weeks.

Sand also used to be the nightmare under the old *régime;* and when the repairs of one sort and another increased, so that it was necessary to put in a fair amount of time every two or three weeks, the new pump was arranged for, and the step certainly has proved the wisdom of the move, for not only was the yield of water doubled and the repairs decreased literally to a minimum, but the excess compressed air generated by a class B, 9x10x12 duplex Rand, is used for forge and gas blowers, condensing, etc., etc.

When the tank is almost filled it operates a float which automatically slows down the compressor, so that there is just enough air to keep a small stream of water running continuously, although even this is not necessary, as it is possible to start pumping any number of wells immediately, and no difficulty is encountered in throwing off the standing column of water, as in the deepest wells there is a series of valves, the number depending on the length of the pipe, which admit the air at different levels, each section valve closing automatically as the water in the different lengths of pipe is expelled.

The perplexing matter of "water level" is again eliminated in the air lift, on account of the absence of working parts below the surface, the only requisite being sufficient pipe to let down into the well, a great and obvious improvement over the old way, which necessitated an amount of work and expense which was no small item in the expense of operating a plant. The water lift in winter is ninety feet, and in summer it is often over 120 feet.

It is a cause for justifiable pride when an engineer can point to a pump which knows no rest and to the compressor that has run evenly and smoothly night and day for over seven years; that reflects well-earned credit on the company that manufactures a system by which the plant is absolutely *sure* of its water supply, and it is just as great a tribute to the man who by his judgment and foresight has insisted upon the adoption of the plan which means the twin milestones on the road to success—economy and efficiency.

City officials are often blamed for lack of economy and for inefficiency when the fault is not theirs at all. Too often the blame is due to some idiotic clause in the city charter, such as that in New York City, prohibiting the use of any patented article, on the plea that it admits of no competition. This is why, many times, cities cannot adopt business methods.

MORRIS R. SHERRERD
President

AMERICAN WATER-WORKS ASSOCIATION

Twenty-fifth Annual Convention—Held at West Baden, Ind., May 8-14

By J. M. Diven

J. M. DIVEN
Secretary

THE arrangements for the convention are about completed. The entertainment committee has made splendid arrangements for the comfort and pleasure of the delegates. The list of papers, as given below, is a good one.

PLACE OF ENTERTAINMENT

The headquarters will be located at the West Baden Springs Hotel, which is practically all there is at West Baden so that the distractions of sight seeing will not interfere with the carrying out of the program, as has been the case when meeting in large cities.

West Baden is a health resort, but it is not necessary for the members of the association or their guests to take the treatment.

The hotel is one of the finest in the world; is a perfectly fireproof structure, fitted with every convenience and comfort that is known to modern hotel practice.

Rates for delegates will be $3.00 to $5.00 per day on the American plan; the price will be according to location and whether with or without bath. All rooms have running water and complete toilet arrangements, telephones, etc., and there are large bathing pools and all such appliances in the house.

PROGRAM

The following papers have been promised, and there are several more in prospect, but the titles have not yet been received.

"Description of Tokyo, Japan, Water-works," Y. Nakajama.

"A Pictorial Appeal (Water-works too), H. F. Dunham.

"Notes on the Density of Pure Water," M. L. Holman.

"Sundry Notes on Deep Seated Water," lantern slide illustrations, Prof. W. P. Mason.

"Concerning Water Softening for Municipal Plants," Geo. W. Fuller.

"Some Experiments with Copper Sulphate," James M. Caird.

"The d'Auria Pumping Engines," illustrated with lantern slides, Mr. d'Auria.

"Some Additional Data on Pipe Coating," F. W. Cappelen.

"Turbine Engines for Water-works," Dabney H. Maury.

"Water Rates, both Fire and Domestic," S. J. Rosamond.

"Commercial Pumping Engines," Chas. A. Hague.

"Books for the Water-works Office," M. N. Baker.

An advance edition will be issued of these and all other papers received in time.

ENTERTAINMENT

Our entertainment committee has arranged the following attractive and well considered list of entertainments and attractions.

Monday, May 8th.—8:30 o'clock p. m.

Informal reception and hop.

Tuesday, May 9th.—3 o'clock p. m.

Carriage drive for the ladies to various points of interest in the vicinity.

8:30 o'clock p. m.

Entertainment in the theater, by talent from the association. (The committee say of this, "It will be well worth a trip to West Baden or any other place.")

Wednesday, May 10th.—10 o'clock a. m.

Carriages will be provided for the ladies, for individual drives to the many points of interest.

3 o'clock p. m.

Progressive Card Party in Ladies' Promenade; handsome prizes.

Thursday, May 11th.—3 o'clock p. m.

Match game of ball between celebrated local teams; West Baden (white) and French Lick (colored).

4:30 o'clock p. m.

Five inning game of Base Ball between active members, Captain Ben Adkins, and associate members, Captain H. J. Putnam. The greatest game ever played.

8:30 o'clock p. m.

Banquet.

10 o'clock p. m.

Grand Ball.

Friday, May 12th.—8 o'clock p. m.

Vaudeville by best professional talent.

IN GENERAL

Bring your golf sticks; there are good links on the hotel grounds. Bowling alleys, billiard and pool tables at the disposal of the guests. A stable of fine Kentucky saddle horses is maintained at the hotel, and are to let at reasonable prices.

All kinds of bathing may be had at the bath house, which contains a large swimming pool.

EXHIBITS

The best facilities ever offered the association for exhibits will be afforded at West Baden. Mr. Fred Mueller, Decatur, Ill., is chairman of this committee, and will give all information as to space, etc.

Time will be allowed on the program for viewing the exhibits and having them explained.

CONVENTION BUSINESS

Though many attractions have been provided by the entertainment committee, this will be a business convention. In addition to the many papers to be presented, read and discussed, the various committees will have important reports to make, amendments to the constitution will be acted upon, and the Question Box will be of unusual interest.

MUNICIPAL JOURNAL AND ENGINEER

Published Monthly by
THE MUNICIPAL JOURNAL PUBLISHING COMPANY
140 Nassau Street, New York

WILLIAM S. CRANDALL, - - - - - - - - Managing Editor
EMIL KUICHLING, C. E., - - - - - - - Engineering Editor

JOHN B. BENNETT, - - - - - - - - - Business Manager
E. J. BUTTENHEIM, - - - - - - - - Assistant Manager
JAMES H. VAN BUREN, New York, - - - Eastern Representative

TERMS OF SUBSCRIPTION
(Payable in Advance)

United States and Canada	$3.00 per year
Foreign Countries	3.00 "
Single Copies, each	.25

Special rates given for clubs of ten or more.

Make all checks payable to The Municipal Journal Publishing Company

Entered at the New York Post Office as second-class matter

NEW YORK, MAY, 1905.

Village Improvements

The village should, at its very start, determine whether it is to be so planned as to be eventually a metropolis, if growth ensues, or to remain a smaller community. Those responsible for the development should decide whether the location has merely the possibility of becoming an important town, dependent upon some neighboring city for many essentials, or whether from its location as a suburb it is to be sooner or later an integral part of a great city. This question of the ultimate tendency must be decided, for upon it depends intelligent planning for future growth.

If the projectors of a village feel that it has a location of natural advantages sufficiently great to make it in the future a metropolis, a fundamental plan, broad in scope, is the first necessity. If it is to be merely a town, with residential suburbs,—a more restricted plan, less expensive to execute, with fewer requirements, will suffice. If it is to be a part of a greater city, it should study the plan of a greater city and so guide its own development as to make it, in time to come, a part of the greater scheme without necessitating radical and expensive changes.

If all this seems impracticable to forecast in the planning of that relatively humble aggregation of homes called a village, there may be at least a clear consideration of the possibilities of growth, in order that such growth may occur along lines in harmony with a safe development. It is recognized that the buoyant spirit of America usually plans a metropolis and sometimes executes a cross-roads; but, nevertheless, the main thought here evident can be considered.

The village can adopt regulations which will foster the planting of trees and preserve those existing; it can control the planting of shrubs and vines, so that when buildings become congested, these evidences of nature's bounty will still remain to relieve and embellish the streets. The village can secure, at nominal cost, open spaces which at a later date may become parks, or the sites of important buildings. Wise regulations will determine the width of the main thoroughfares, so that for all time they will be adequate to requirements. The village may foresee the future possibilities of great semi-public and public buildings; of markets, warehouses and railway terminals, of commercial and industrial facilities. In other words, wise forethought may direct a moderate expenditure which at a later date will return a hundred-fold on the investment.

Frederick S. Lamb.

An Important Factor in Municipal Development

Most municipal officials who do things are always glad to know "what the other fellow is doing" and how he does it. Most practical men like to meet their fellows who are similarly employed; as by touching elbows and meeting in annual convention they acquire many of the smaller details in municipal engineering and administrative work. For this reason the up-to-date city engineer, board of health works commissioner, superintendent of water works, lighting plant or the head of any administrative department of city government is glad to attend the annual meetings of the American Society of Municipal Improvements. The proceedings of the eleventh annual convention of this society, held at St. Louis last October, were recently published, and it only takes a cursory glance through the pages of this volume to show how important a factor an organization of this kind may be in the general betterment of American cities.

An effort is being made on the part of the society to more than double its membership the present year, and for this reason it will not be out of place to give its name and object, as stated in the Constitution:

"The objects of this society, which shall be known as 'The American Society of Municipal Improvements,' shall be to disseminate information and experience upon, and to promote the best methods to be employed in the management of municipal departments, and in the construction of municipal works, by means of annual conventions, the reading and discussion of papers upon municipal improvements, and by social and friendly intercourse at such conventions, and to circulate among its members, by means of an annual publication, the information thus obtained."

As to membership, according to the Constitution:

"Any municipality within America shall be eligible to membership in this society; likewise any engineer, officer or director who shall have charge of or supervision over or be employed as a consulting engineer on any public or municipal department work. When a municipality has become a member of the society, then any person of such municipality representing any municipal board or department, or any proper person interested in municipal improvements, who is not a contractor or contracting agent, may also become a member.

"Any member who shall have ceased to have charge or supervision of any public or municipal department or work may retain his membership, unless he shall have come under the restrictive requirements of associate membership, when he shall retain membership as an associate only.

"Every application for membership shall be in writing, stating the name, location and department, if any; and, if of an individual, shall also state age, residence and position of the applicant, if any.

"Any proper person interested in municipal improvements or work as a contractor or contracting agent, or who is a manufacturer or dealer in municipal supplies, may become an associate member, who shall enjoy all the rights and privileges of full membership, excepting that of holding office or voting."

All applications for membership should be addressed to the secretary, George W. Tillson, C. E., Municipal Building, Brooklyn, N. Y.

Water Waste in Buffalo

ONLY a few years ago not a daily newspaper in the city of Buffalo would give support to a movement on the part of the city officials to check the extravagant and wasteful use of water by domestic consumers. There are two means of preventing water waste, the most efficient of which is the use of meters; the other may be called a supplementary method only, namely, regular and thorough inspection of all services. When the editor of THE MUNICIPAL JOURNAL, some five years ago, made a thorough investigation of the city government of Buffalo, he strongly recommended in several interviews the general introduction of meters by the water department of that city. The officials concurred heartily with his opinion but his position was generally criticized by the press. Now that the city seems to have had a change of heart, so to speak, it is gratifying to quote the following editorial from the Buffalo *Express,* which names the city of Syracuse—where meters are generally used—as an example worthy of imitation:

"Syracuse has a water problem very similar to the one that confronts Buffalo. It discovered that the difference between supply and consumption is not sufficient to maintain an adequate reserve and the authorities were satisfied that the large consumption was due to waste. They had the choice of two courses—either to build a new conduit by which to increase the supply, at a cost of $1,250,000, or to check the waste.

"In similar circumstances the Buffalo authorities would not even consider the idea of checking waste. They were for a duplicate plant and the continuance of the effort to pump Niagara river dry. The Syracuse authorities, however, took a different view of the question. They decided that the first thing to do was to check the waste. Thereby they reasoned that the addition of $1,250,000 to the city's debt might be postponed for some years, at least.

"Having already 8,000 meters in use, the Syracuse people were satisfied that the way to check the waste was to enforce a more general use of meters. Accordingly, arrangements were made by which the city is to supply meters to consumers at $8.50 each, including cost of installation. The city did not consider that it was under any obligation to give the meters to consumers, as it is assumed Buffalo would do. Then an ordinance was adopted increasing the rate on unmetered water $1 after July 1st, $2 after January 1, 1906, and directing that all unmetered service be cut off after July 1, 1906. It is pointed out to the people that they will save in taxes what they have to spend for meters and they are complying with the law cheerfully.

"That is a businesslike way to handle the water problem. But it is not Buffalo's way. In Buffalo it may be expected that the Common Council will forget about the annoying water question until the insurance companies exert pressure again or next winter brings another water famine. Then it will become panic-stricken and vote a bond issue of $2,500,000 to double the capacity of the water plant and permit the waste to go on."

The Lighting Investigation in New York

WHILE the lighting investigation undertaken by a committee composed of legislators of the State of New York is wholly a partisan affair and conducted along party lines, yet it has already brought to the surface and exposed to public view many facts which have long been known, morally, to exist, but of which, prior to this investigation, the public had no definite knowledge. The investigation has shown that not only is the stock watered, but the gas also. In the examination of an expert on meters, it was demonstrated that no matter how much the price of gas might be reduced it would not lower the monthly bills, for the reason that the amount of gas supposed to be consumed would be raised by a forced pressure from the central plant of the company. Judging from the testimony of this expert it is quite evident that the gas company has everything its own way. And much the same facts were elicited in investigating the electric lighting company.

In the examination of the city officials an effort was made to connect them with the crooked work involved, but thus far no complicity has been shown. The methods of bookkeeping of both the gas and electric lighting concerns, however, reveal that New York is in the hands of a monopoly. Also, that while the minimum value—in fact several times less than its actual value—is placed on the properties when being appraised for the purpose of taxation, more than the maximum value is given to the total stock valuations for the benefit of the owners. This, of course, can be for no other purpose than to defraud the public treasury.

The investigation is drawing to a close as we go to press. A complete report will appear in the June number.

Editorial Comment

A TAXPAYERS' LEAGUE was organized in Portland, Oregon, April 14th, 1899. Its object, as stated in the constitution, is "to unite taxpayers in one potential non-political body, for the purpose of protecting the general welfare of the city; to place municipal and county administration on a business basis; to maintain and enforce the law; to reduce the expense of county and city administration to the lowest

cost consistent with good government." Mr. L. J. Goldsmith is the Secretary of this organization, and recently made an extensive trip East, investigating all kinds of pavements for the purpose of determining what kinds should be used on various streets of Portland. This shows the thoroughness with which the Taxpayers' League examines every extensive public improvement before it is made. It would be beneficial to most American cities if all had similar organizations, working with the same intelligence.

MUNICIPAL STREET SPRINKLING is needed in Cleveland, Ohio, according to the information of Water Works Superintendent Edward W. Bemis. At present the streets are sprinkled under the contract system, and Mr. Bemis thinks it does not work well, for recently, in riding along some of the East End streets the dust was so prevalent that it made his morning ride exceedingly uncomfortable. For this reason he has made the suggestion to the President of the Board of Public Works that the city sprinkle its own streets. We think that Mr. Bemis is correct in his opinion, for municipal street sprinkling has yielded better results than the contract system. The care of the streets should never be left to the hands of contractors.

THE PRESERVATION OF PUBLIC RECORDS is generally neglected by American cities. There have been many fires in city and county buildings during the past year, and almost without exception many valuable public records have been destroyed. A recent instance in New York is cited by a correspondent of one of the daily papers, as follows:

"Having tried to examine some important documents in a public office I found it was impossible to do so, as they had been recently destroyed by an office fire. Inasmuch as there are fireproof record books and fireproof asbestos boxes made which are absolutely fireproof, why do not all our public officials having charge of valuable public records and papers make use of fireproof devices for safeguarding them? That a building is fireproof is no safeguard if the contents of a room are inflammable, as the greater number of fires occur in rooms which of themselves may be fireproof, but the contents, being paper, are highly inflammable."

It is a foolish economy on the part of any municipality, large or small, to neglect its public records in this way. Compared with the value of the records preserved, the cost of furnishing any public building or office with the necessary furniture is infinitesimal.

MUNICIPAL ART FOR CHICAGO.—Benjamin Ferguson, a lumber merchant of Chicago, who recently died, left a bequest of one million dollars to the Art Institute of Chicago, the income from which is to be used to erect and maintain statuary and monuments in the parks, along the boulevards and in every public place in Chicago, commemorating worthy men or women of America, or important events of American history. It is not putting the case too strongly to say that notwithstanding there is more room for improvement in the city of Chicago, it is showing greater energy and wisdom in its city affairs than any other large city in the United States. It has already taken the lead in practical municipal reform, obtaining satisfactory results by means of its Municipal Voters' League. It recently opened, under favorable auspices, the first Municipal Museum in the United States. It has repeatedly voted in favor of municipal ownership and operation of all public utilities, and in the recent election of Mayor Dunne it proposes to insure the ownership and operation of its street railway systems in the near future. This bequest furnishes another reason why Chicago may be looked upon as the most progressive city in the United States. It will be well for New York and Philadelphia if they awaken in time to catch up with Chicago, for she is now far in the lead.

THE CANADIAN MUNICIPAL JOURNAL, Volume 1, Number 1, was recently laid on the Editor's table. It is a monthly magazine, devoted to the interests of municipalities in all Canada and the official organ of the Union of Canadian municipalities. Its price is one dollar per year, single copies ten cents. Its office of publication is 107 St. James street, Montreal. As many of its readers are Canadian Frenchmen, a few of its articles are printed in French. Its contents for March indicate its scope. Among the contributed articles are: "Water Works Extensions in Toronto," by C. H. Rust, C. E., City Engineer of Toronto; "Municipal Institutions in the Province of Quebec," by His Honor, Recorder Weir, D. C. L.; "Acetylene Gas," by G. G. Pond, Ph. D.; "Who Owns Toronto's Streets?" by V. A. Grant. It is edited for the lay reader more than the technical official and is sure to develop and further the interests of Canadian municipalities. THE MUNICIPAL JOURNAL gives it a hearty welcome and wishes for it a long, useful and prosperous life.

Personalities

—Mr. John A. Jones, city engineer of Lewiston, Me., has been re-elected.

—Mr. Ralph E. Shaner has been re-elected borough engineer at Pottstown, Pa.

—Mr. Alexis H. French has been re-appointed city engineer at Brookline, Mass.

—Mr. Robert Hooke, city engineer of Chattanooga, Tenn., has been re-appointed.

—Mr. Frederick C. Schneider has been elected city engineer at New Brunswick, N. J.

—Mr. Frank O. Sinclair, M. Am. Soc. C. E., city engineer of Burlington, Vt., has been re-elected.

—Mr. W. L. Thompson has been appointed engineer for the village and township of Ridgewood, N. J.

—Mr. David S. Rundlett has succeeded Mr. John H. Perkins as superintendent of the water-works of Watertown, Mass.

—Mr. W. P. Darwin has been appointed assistant engineer in the engineering department of the District of Columbia.

—Mr. George W. Lilly, M. Am. Soc. C. E., Columbus, O., has resigned his position as assistant engineer of the Department of Public Service of that city.

—Mr. William Starr has been elected city engineer of Bridgeport, Conn., to succeed Mr. H. G. Schofield, who has held that position for the last thirty years.

—Mr. Ernest Adam, for thirty-nine years connected with

the engineering department of Newark, N. J., has resigned his position as city engineer owing to ill health.

—The offices of water superintendent and city engineer have been consolidated at Barre, Vt., and Mr. Charles R. Allen, Jr., has been appointed to the new office.

—Former State Senator Horatio S. Earle, Detroit, Mich., has announced himself as a candidate for governor. THE MUNICIPAL JOURNAL wishes him a successful run.

—The East Orange (N. J.) City Council has appointed Mr. Arthur A. Reimer as superintendent of the Water Department and Mr. Edgar Williams as city clerk.

—Mr. H. W. Scott, principal assistant engineer of Seattle, Wash., will take charge of the duties of City Engineer R. H. Thompson while the latter is away on his trip to Europe.

—Former Mayor James M. Seymour, of Newark, N. J., died on April 1st, from apoplexy. Mr. Seymour was thrice elected mayor of Newark and previously held positions of trust on several boards of city government.

—Mr. Theodore H. Hinchman, Jr., has been appointed lighting commissioner of Detroit, Mich., Mr. Jacob J. Haarer, as commissioner of public works, and Mr. Robert E. Bolger, re-appointed park commissioner.

—Mr. Edward B. Ellicott, who has been the head of the municipal electrical department of the city of Chicago, has been appointed chief engineer of the Chicago drainage canal, and will supervise the water power of the canal.

—Mr. J. W. Stearns, formerly with the New York, New Haven and Hartford R. R., and later with the Big Four R. R. on track elevation work, has been appointed assistant city engineer of Indianapolis, Ind., to have charge of track elevation.

—Mr. John C. Trautwine, Jr., Philadelphia, has resigned his position as secretary of the Association of Engineering Societies, which he has held since January, 1894. He will be succeeded on May 1 by Mr. Frederick Brooks, 31 Milk street, Boston, Mass.

—Mr. W. W. Crosby has been elected to succeed Mr. A. N. Johnson as chief engineer of the highway commission of the Maryland State Geological Survey. Mr. Johnson recently resigned to become highway engineer at the Office of Public Roads Inquiry, Department of Agriculture, Washington, D. C.

—Former Mayor James Brinton, of Des Moines, Ia., according to a press dispatch, is now one of the day laborers employed by that city in the sidewalk department. Mr. Brinton says that politics drove him into the saloon business—in which he failed—to keep his wife and children from starvation, but he now declares that he has quit both for good.

—Mr. L. J. Goldsmith, secretary of the Taxpayers' Association of Portland, Ore., recently made an extensive tour of American cities for the purpose of investigating pavements, particularly the "bitulithic." "In all my travels and investigations," he said, "I have found no adverse criticisms of the bitulithic pavement."

—Mayor Frank E. Moores, of Omaha, was married to his private secretary, Miss Mary R. Malone, at Phoenix, Arizona, March 15th. The mayor spent the greater part of the winter in that city, where the wedding was solemnized quietly. Mrs. Moores was in the office of the mayor a number of years and was of considerable assistance to him in his campaigns.

—Mr. Joseph Medill Patterson has been named as the commissioner of public work of Chicago by Mayor Dunne. Mr. Patterson is only twenty-six years of age and probably the youngest official in the United States occupying so important a position. He is a grandson of the late Joseph Medill of Chicago and a son of Mr. Robert W. Patterson, the editor of the Chicago *Tribune*.

—Mr. John P. Breen has been elected city attorney of Omaha to fill out the unexpired term of Mr. Carl C. Wright, who resigned to become the assistant general attorney for the Northwestern Railway System, west of the Missouri. Mr. Wright had charge of the water-works apraisement case, now in the hands of the appraisers, and handled it so as to cause warm praise from the taxpayers. He was elected on the Democratic ticket, and is succeeded by a Republican.

—Mayor George H. Williams is affectionately known by his fellow citizens as the "Grand Old Man" of Portland, Ore. He is probably the oldest mayor now serving any municipality in the United States. He is the only surviving member of President Grant's cabinet, and recently celebrated his eighty-second birthday. During the three years that he has been mayor of Portland, he has never been absent from a meeting of the city council. He is a candidate for renomination on the Republican ticket and declares that if he were not engaged as the chief executive of the city he would take up the practice of law again, or go to writing, as he cannot stand it to be without work.

—August Hembold, M. D., Mayor of Newport, Ky., in his annual message takes a strong stand in favor of a municipal electric lighting plant. The city is paying $90 and $100 per arc lamp, which the mayor demonstrates by comparative figures to be extortionate, and he further shows that the city has the power conferred by its charter for the undertaking, and that it has the financial strength to pay for the plant from the ordinary revenues. The cost of installing a plant of the necessary capacity would not exceed $38,000, of which $10,000 is already available and the balance could be subtracted from the city's income in two annual instalments. The plan was voted on by the electors a year ago and though the proposition received a large majority of the votes cast it fell just short of the necessary two-thirds.

Result of Recent Elections

The following is a partial list of newly elected and newly appointed city officials:

PENNSYLVANIA

York, Pa., James St. Clair McCall, mayor; John R. Lafean, treasurer; Jacob K. Sechrist, controller; Charles R. Schreiner, city clerk; Samuel Cormeny, chief of fire department.

NEW YORK

Tonawanda, William J. Kibler, mayor; George H. Hoffman, re-appointed treasurer by Common Council. This election was due to the resignation of Mayor Frank I. Alliger.

ILLINOIS

Moline, Andrew Olson, mayor; C. G. Carlson, city clerk; G. A. Shallberg, city attorney; H. F. Vierich, city treasurer.

East St. Louis, Silas Cook, mayor, re-elected.

Galesburg, Luke W. Sanborn, mayor.

Macomb, I. M. Fellheimer, mayor.

Oneida, W. F. Glenn, mayor.

Quincy, John A. Steinbach, mayor.

Rock Island, George W. McCaskrin, mayor.

Yates City, Jackson Mason, mayor.

Evanston, John T. Barker, mayor; John F. Hahn, city clerk; F. H. Anderson, treasurer; George N. Woodley, attorney.

MISSOURI

St. Louis, Rolla Wells, mayor, second term.

Joplin, C. W. Lyon, mayor; E. F. Cameron, attorney; Julius Becker, treasurer.

Jefferson City, Henry J. Wallau, mayor.

Aurora, Dr. I. A. Cottingham, mayor.

Carl Junction, H. B. Robinson, mayor.

KANSAS

Kansas City, William W. Rose, mayor.

Leavenworth, Peter Everhardy, mayor.

Wichita, Finley Ross, mayor.

Ottawa, John Halloran, mayor.

Emporia, O. B. Hardcastle, mayor.

NEBRASKA

Lincoln, Frank W. Brown, mayor.

OKLAHOMA

Guthrie, Dr. Duke, mayor.

INDIAN TERRITORY

Muskogee, Dr. F. B. Fite, mayor.

COLORADO

Colorado Springs, Henry C. Hall, mayor.

WISCONSIN

Racine, Peter B. Nelson, mayor; William H. Armstrong, city clerk.

Oshkosh, John Banderob, mayor.

La Crosse, William Torrance, mayor.

Whitewater, J. G. Kestol, mayor.

MONTANA

Butte, John MacGinniss, mayor; Philip Goodwin, treasurer.

Deer Lodge, C. D. Joslyn, mayor.

CALIFORNIA

Oakland, Frank K. Mott, mayor.

MICHIGAN

Bay City, Gustave Hine, mayor; C. J. Barnett, comptroller; Edward E. Corliss, treasurer; John Boston, recorder.

TEXAS

Brenham, William Lusk, mayor; Seth Searcy, attorney; D. T. Wilkins, city clerk; R. Hoffmann, treasurer.

Lampasas, H. H. Berry, mayor.

La Grange, Robert Samples, mayor; E. H. Moss, attorney; Edward Mattingly, treasurer.

Denison, John James, chief of police; Thomas Foley, treasurer; W. S. Pearson, recorder.

Rusk—L. D. Guinn, mayor; C. B. Emanuel, city attorney; J. F. Tatham, recorder.

Jefferson, C. W. Carlson, mayor.

Lufkin, R. B. Shearer, mayor.

Holland, N. Olson, mayor.

Convention Dates

May

—American Water Works Association, West Baden, Ind., May 8-12. J. M. Diven, secretary, Charleston, S. C.

June

—American Society of Mechanical Engineers, Scranton, Pa., June 6-9, 1905. R. F. Hutton, secretary, 12 West Thirty-first street, New York, N. Y.

—American Institute of Electrical Engineers, Asheville, N. C., June 19-23, 1905. R. W. Pope, secretary, 95 Liberty street, New York, N. Y.

—American Society of Civil Engineers, Cleveland, O., June 20-23, 1905. Charles Warren Hunt, secretary, 220 West Fifty-seventh street, New York, N. Y.

August

—League of American Municipalities, Toledo, O., August 23-25, 1905. John MacVicar, secretary, Des Moines, Ia.

—International Association of Municipal Electricians, Erie, Pa., August 29-31, 1905. Secretary, Frank P. Foster, Corning, N. Y.

September

—American Society of Municipal Improvements, Montreal, Can., September 5-7, 1905. Secretary, George W. Tillson, Municipal Building, Brooklyn, N. Y.

American Society of Municipal Improvements

A PRESCOTT FOLWELL, President, ... Easton, Pa.
GEORGE W. TILLSON, Secretary, . . . Municipal Building, Brooklyn, N. Y.

THIS society was organized in Buffalo, N. Y., September 19, 1894, by about sixty representatives of seventeen cities, who responded to an invitation issued by M. J. Murphy, Street Commissioner of St. Louis, who was elected the first president. The object of the society is stated in the constitution to be "to disseminate information and experience upon, and to promote the best methods to be employed in, the management of municipal departments and in the construction of municipal works, by means of annual conventions, the reading and discussion of papers upon municipal improvements, and by social and friendly intercourse at such conventions, and to circulate among its members, by means of an annual publication, the information thus obtained."

The society as organized contained twenty-nine (50 per cent.) members of boards of public works, eight (14 per cent.) mayors and councilmen, six (10 per cent.) city engineers, seven (12 per cent.) street and sewer commissioners, and a few others. The following year 34 per cent.

of the members were members of boards of public works, 7 per cent. mayors and councilmen, 24 per cent. city engineers, 7 per cent. street and sewer commissioners, 7 per cent. water-works officials, and 20 per cent. held other positions. In 1904, 16 per cent. were members of boards of public works, 6 per cent. mayors and councilmen, 22 per cent. city engineers, 19 per cent. other engineers in city service, 7 per cent. street and sewer commissioners, and 11 per cent. water-works officials. Its presidents have been in succession a street commissioner, president of board of public works, president of board of administration, member of board of public works, engineer of highways, city engineer, president of board of public improvements, city engineer, city engineer, chairman of water committee and consulting municipal engineer. Canada and most of the States east of the Rockies are represented in the society's membership, and conventions have been held at Buffalo, Cincinnati, Chicago, Nashville, Washington, D. C., Toronto, Milwaukee, Niagara Falls, Rochester, Indianapolis and St. Louis. The next is to be held at Montreal, September 4th to 6th.

The original idea was that municipalities should become members, to be represented by such "engineer, officer or director" of "public or municipal department work" as should choose to join; such individuals to lose their eligibility and membership with their public office. This was found to be cumbersome and inconvenient, the first president losing his membership before the end of his term. Provision was made in 1895 that such might remain as associate members; and in 1900 that they might retain full membership. In the same year it was also made a provision of the constitution that "any person interested in municipal improvements or work as a contractor or contracting agent, or who is a manufacturer or dealer in municipal supplies may become an associate member who shall enjoy all the rights and privileges of full membership excepting that of holding office or voting." One of the advantages of this society has been that it is not composed entirely of engineers or of administrative officers, but that all classes who are interested in the physical improvement of cities exchange views at its conventions. The chief disadvantage under which it originally labored was the brief time for which many of its members retained their eligibility. Five years after its organization, when the above change in the constitution was made, but six of the original members remained; but more than a third of those who were then members are still so, although most of them no longer hold office.

To prevent the work of the society from being confined to one or two narrow channels and to secure proper attention to each of the several more important branches of municipal improvements, there is appointed each year by the president, committees on street paving, electric street lighting, sewerage and sanitation, water-works and water supply, taxation and assessments, city government and legislation, disposition of garbage and street cleaning, review, and municipal franchises; while special committees on municipal data and statistics and park development and maintenance have been appointed for several years past. Each of these committees generally presents a report at each convention, and also obtains one or more papers on subjects within its field of activity. These conventions are by no means junketing trips, but are devoted by all members to earnest endeavors to obtain and contribute the greatest amount of benefit possible, through conversation with officials from all parts of the country, inspection of such improvements as the convention city has to show, and papers and discussions —the last frequently more interesting than the papers which occasioned them. Most of the members are men whose business it is to do things and who wish to learn how to do them better.

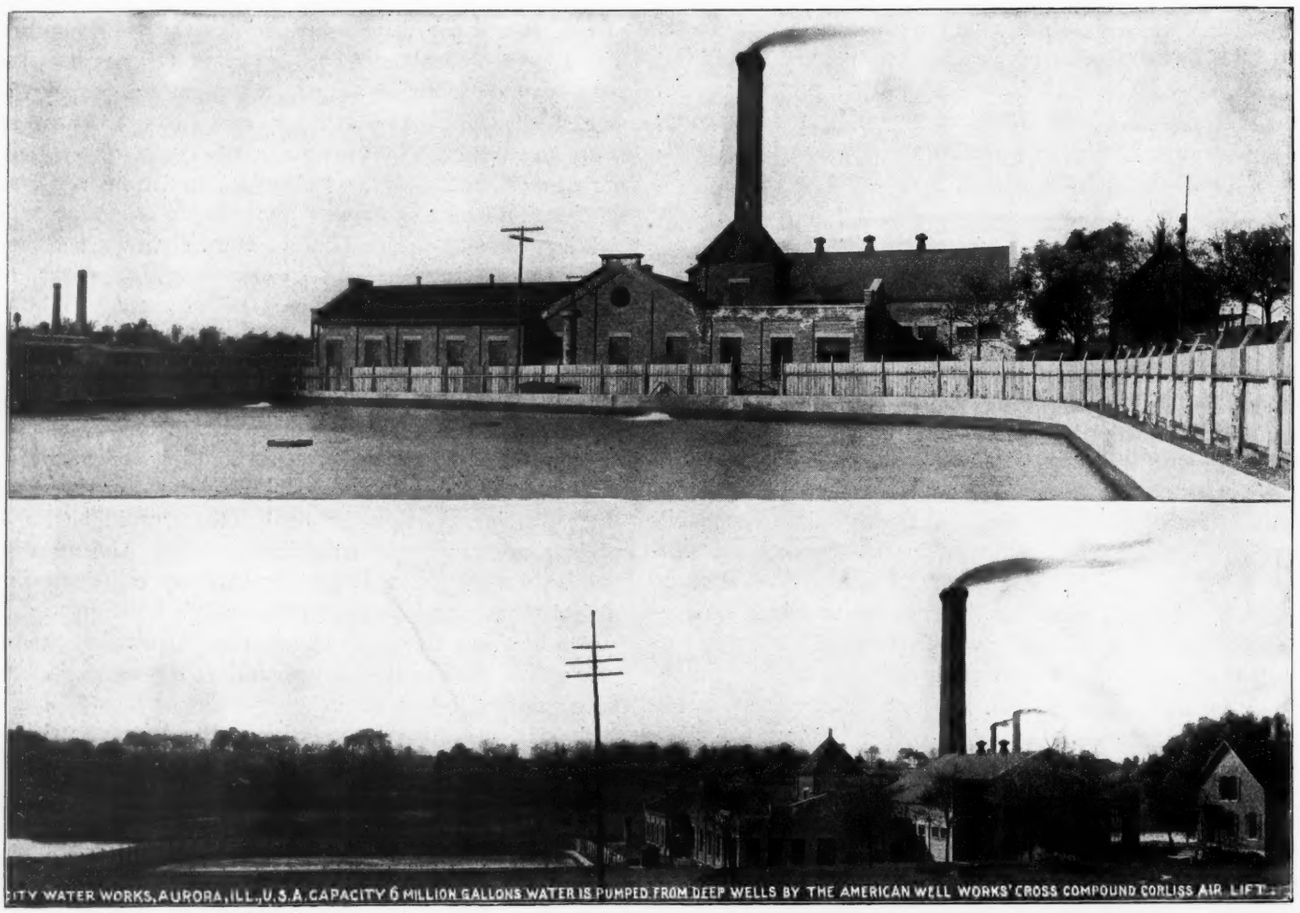
The extent to which different parts of the field have actually been covered by the society is indicated by the number of reports and papers presented by the various committees. There have been about fifty-five papers (25 per cent.) on street paving, eighteen (7 per cent.) on other street improvements, thirty-five (16 per cent.) on water works, thirty (14 per cent.) on sewerage, fifteen (7 per cent.) on garbage disposal and street cleaning, twelve (6 per cent.) on taxation and assessments, ten (5 per cent.) on street lighting, nine (4 per cent.) on health, eight (4 per cent.) on legislative subjects, six (3 per cent.) on parks, and twenty miscellaneous. Of the good accomplished by the society, the greater part cannot be designated specifically since it consists of the improved usefulness of its members to their municipalities both as officials and as citizens. The writer has in mind instances, however, of improvements in street paving and repair, in street lighting and in garbage disposal in certain cities which were the direct result of these meetings; and undoubtedly others could be learned of in every branch of municipal activity. Uniformity of municipal statistics, so longed for by every collector of municipal data for whatsoever purpose, has been greatly promoted by this society. In all branches the aim has been not so much to deal with such technical details as might better be considered by an engineering society and would differ with local conditions as to discuss the broader principles of more general application, and along this line it believes it can perform and is performing a work of great and permanent benefit to American municipalities.

BROWN TAIL AND TUSSOCK MOTHS.—In the report of the Park Commissioners of Cambridge, Mass., the gipsy, brown tail and tussock moths receive attention, and a thorough campaign through the infested trees is recommended. Recognizing that eternal vigilance is the price that must be paid to save the trees, the report says: "The most effectual method of destroying the brown tail moth is to remove and burn the nests. This should be done during the fall and early winter when the nests can easily be seen. In the case of the brown tail moth, action looking to the prevention of damage by the caterpillars is of more importance than the application of remedies after the insects have commenced feeding. Their webs are attached to the tips of the twigs, are grayish-white in color and easily seen when the foliage has fallen from the trees. Nothing is easier than to cut them off and burn the webs." Wherever the gipsy and tussock moths are found, the egg clusters are painted with creosote. During the fall, 4,586 street trees were treated in this way.

The Water Works of Aurora

THERE are few artesian water supplies in the country which are maintained on as economical a basis as that of Aurora, Ill. The superintendent of the plant, W. R. Rees, gives the following description, which cannot fail to interest the readers of THE MUNICIPAL JOURNAL:

"In 1902, the city of Aurora contracted with The American Well Works, of Aurora, for an air compressor, of the compound steam Corliss type, of 260 horse-power and guaranteed to raise 2,000,000 gallons of water from four artesian wells in twenty-four hours.


ITY WATER WORKS, AURORA, ILL., U.S.A. CAPACITY 6 MILLION GALLONS WATER IS PUMPED FROM DEEP WELLS BY THE AMERICAN WELL WORKS' CROSS COMPOUND CORLISS AIR LIFT

Courtesy, The American Well Works, Aurora, Ill.

PUMPING PLANT AND RESERVOIR, AURORA WATER-WORKS

"This machine has been in continuous operation ever since its installation in November, 1902, with practically no expense for repairs during that period. Our average pumpage for twenty-four hours is 1,500,000 gallons. At the time of the machine's acceptance it was thoroughly demonstrated that it could raise the required amount of water, and on April 27, 1903, on account of a large fire, the daily pumpage amounted to 2,211,000 gallons, a larger amount than guaranteed.

"The air cylinders of the machine are equipped with automatic air valves, which have given perfect satisfaction, and we think them superior to any other valve designed for this work. The governor is equipped with an automatic stay, which is a valuable thing in case of an accident or brakedown.

"The pumping record for 1904 was as follows: total number of gallons pumped, 515,212,750, or a daily average of 1,411,541 gallons. There were 4,399 tons of coal used at an expense of $10,766.55, making an average of twelve tons of coal consumed daily at an average cost of $29.40.

"The expenditures of the department for the year 1904 were as follows:

Interest on bonds	$7,244 97
Salaries, Board of Public Works	360 00
Salaries, superintendent and assistant	1,980 00
Salaries, engineers	1,554 37
Buildings and grounds	306 66
Machinery repairs	3,696 33
Printing and Stationary	176 25
Operating expenses	13,189 40
Miscellaneous and clerk hire	914 11
Firemen, salaries	1,646 34
Pipe laying	2,009 64
Notes paid	5,500 00
Interest on notes	130 82
Total	$38,708 89
Fund overdrawn December 31, 1904	$839 55

The depth, size and cost of the four artesian wells are as follows: No. 1, diameter, six inches; depth 2,236 feet; cost, $5,519.69; No. 2, diameter, ten, eight and six inches; depth, 2,440 feet; cost, $13,678.48; No. 3, diameter, six inches; depth, 2,270 feet; cost, $6,375.48; No. 4, diameter, six inches; depth, 2,250 feet; cost, $5,617.96.

Omaha's New Charter

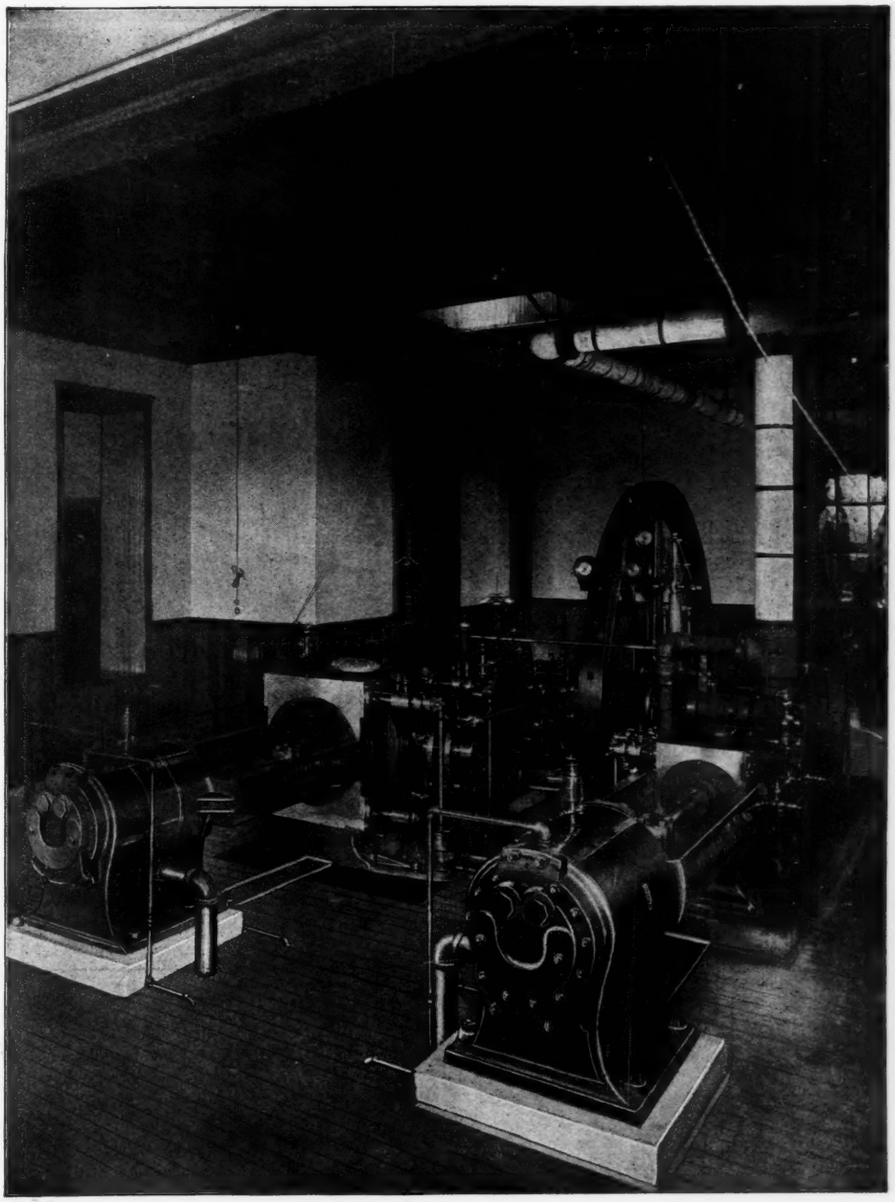
OMAHA is now working under a new charter passed by the legislature which adjourned late in March. There are a number of important changes under the new law. Arrangements are made for dispensing entirely with the services of the city treasurer and city tax commissioner when the terms of these officers expire in May, 1906. Their duties are to be performed by the county treasurer and assessor, respectively. By so doing it is thought from $25,000 to $40,000 can be saved annually. In return for its services the city pays the county one per cent. of all tax and license collections. The board of county commissioners will make the levy as certified to and demanded by the city council and school district of Omaha. A strong movement was exerted to detach the cities of Omaha and South Omaha and surrounding villages into a separate corporation combining city and county governments, but this failed and the merger of the two departments was all that was accomplished along this line.

The new charter abolished the Board of Public Works and Advisory Board. The duties of the former consisted solely of awarding contracts and authorizing specifications for all kinds of public work under the direction of the council. The Advisory Board acted as a board of health and bought supplies. The members of both bodies derived their authority ex-officio from other offices. It was found that the Board of Public Works, which had powers contravening those of the city engineer, caused delays, confusion and inefficiency in the execution of paving and other public works. It was composed of the engineer, comptroller and building inspector, and had to approve specifications made by the engineer. This the majority would not do for two years, owing to a fight among paving contractors, and much paving has been held up for that length of time. The duties of both boards are transferred to the mayor and council. In his own department the engineer is in control, except for the moderation and direction of the mayor and council.

By the new charter the number of wards of the city, which has 125,000 population, is increased from nine to twelve, with one councilman elected by the whole city from each ward serving a term of three years. Salaries of councilmen are increased from $900 to $1,500 a year; the mayor from $2,500 to $3,000; city clerk from $2,000 to $2,500; city attorney from $2,500 to $3,500; assistant city attorney from $1,800 to $2,000; city engineer from $2,500 to $3,000; assistant city engineer from $1,800 to $2,000.

Among other changes are the payment of day laborers by the week instead of by the month, to prevent assignments and warrant shaving; a regulation compelling strict attendance of councilmen at meetings and prescribing radical penalties for appropriating money for things and in manners prohibited; a rule compelling the mayor and council to make contracts for service with public utility corporations by ordinances that must lay over one week, and in no other way; a provision for pensions for firemen and policemen who have served fifteen years and are more than fifty years old.

An attempt to secure legislation requiring only an "eight



Courtesy, The American Well Works, Aurora, Ill.

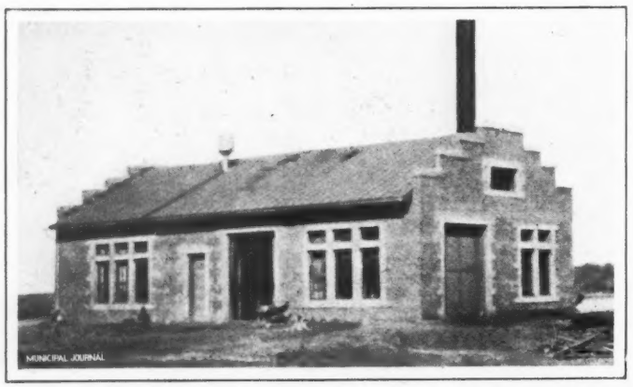
260 H.-P. AIR COMPRESSOR, COMPOUND STEAM CORLISS TYPE, MADE BY THE AMERICAN WELLS COMPANY, AURORA, ILL.

hour shift" for firemen failed owing to the opposition to the fire chief and boards of fire and police commissioners.

The charter was passed largely as drawn up and prepared by a committee of citizens representing the Real Estate Exchange, Commercial club, municipal government and improvement clubs.

Ardmore City Water Works

MUNICIPAL ownership and operation of all public utilities is becoming more and more popular in every State and terriotry of the Union. The citizens of Ardmore, the metropolis of the Indian Territory, have settled the question as to who shall own and operate its water system by establishing a plant which is modern in every particualr, and which will, with slight additions, afford an ample supply of pure water for domestic, fire protecting and manufacturing purposes for many years to come.



PUMPING STATION OF ARDMORE WATER-WORKS

According to the census returns for 1900 there were twenty-one incorporated places of 1,000 inhabitants and over, of which Ardmore was the largest, having a population of 5,631. Ardmore is located on the highest point between Galveston and Kansas City, and is surrounded by a splendid agricultural land, which is also rich in coal, oil and asphalt. Its natural advantages are such as will insure its rapid development as the most populous center in the Territory.

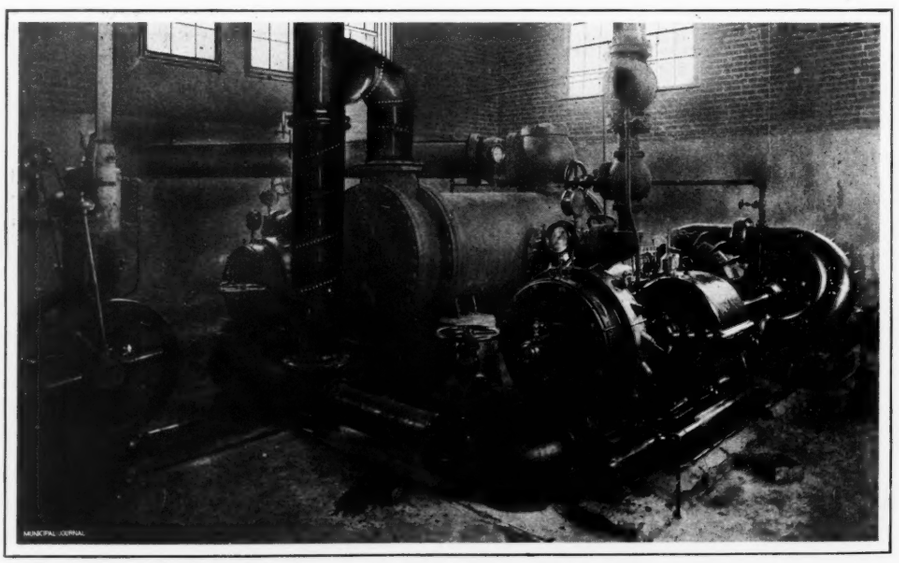
Like the city of Boston, Ardmore has looked ahead and made ample provisions for the future growth of the population. Its pushing officials and public spirited citizens do not believe in doing things by halves, and for that reason, in designing the systems of water-works, three points were given careful consideration, namely, first, provision for future extensions of the city limits; second, minimum cost of operation; the construction and installation of the most modern plant in every respect. These provisions have been carried out with the utmost fidelity and as will be observed by the brief description of the plant as given by Mayor R. W. Dick, as follows:

"The pumping station is located about five miles from the city and the water is taken from a beautiful lake formed by a small dam at the end of a natural basin. The city owns the land forming the water shed for this lake, and the water is pure and free from any objectionable features at all seasons of the year.

"The pumping machinery was installed complete by the D'Olier Engineering Company, engineers and contractors, of Philadelphia and New York. The installation consists of two water tube boilers of a nominal capacity of 75 horse-power each, built to operate under 160 pounds steam pressure, and two 110 horse-power De Laval steam turbine centrifugal pumps, each having a capacity of 2,500 gallons of water per minute against a total head of 250 feet, arranged to operate condensing in connection with a surface condenser. The pumps are so arranged that for fire service they can be operated under a head of 310 feet. The two pumps are exactly similar, and form a duplicate installation, either unit being more than sufficient to supply the estimated requirements of the city for a number of years.

"After the installation had been in service for some time, the apparatus was rigidly tested, and found to conform in every respect to the guarantees. The duty of the pumps, when running under the specified condition, was 75,000,000 foot pounds per 1,000 pounds of steam."

COBBLING OF GUTTERS IN MERIDEN, CONN., was extended during the past year as far as was possible with the funds at the disposal of the Board, but it has not been able to do more than complete the orders issued by the council calling for gutters to be placed in connection with the setting of new curbs, and there are many unfinished gutters throughout the city where the curbs have been set by the abutting property owners. There were 28,325 square feet laid with new stone during the year at a cost ranging from 5 cents to 6.6 cents, and 11,397 square feet were re-cobbled at from $0.0174 to $0.0393.



INTERIOR OF ARDMORE WATER-WORKS PUMPING STATION, SHOWING TWO 110 H.-P. DE LAVAL STEAM TURBINE CENTRIFUGAL PUMPS

To a Chicago Critic

Municipal ownership of public utilities is bunk.—*Carter Harrison.*

Why hast thou thunk
That municipal ownership of public utilities,
With its great political and other facilities,
Is bunk?

Why hast thou thunk
That municipal ownership of public utilities,
With its grasping and grafting capabilities,
Is bunk?

Why hast thou thunk
That municipal ownership of public utilities,
With its potent pecuniary possibilities,
Is bunk?

Why hast thou thunk
That municipal ownership of public utilities,
With its visibly venal and vicious virilities,
Is bunk?

Why hast thou thunk
That municipal ownership of public utilities,
With its crookedly active, aggressive agilities,
Is bunk?

Say, Carter, say,
Why hast thou thunk,
This dream of civic cranks
Is bunk?
If thou thinkest
This be bunk,
Perish the thought
That thou hast thunk.

W. J. L., in N. Y. *Sun.*

Municipal Light Wanted in Greenfield

THE town of Greenfield, Mass., recently appointed a committee to examine the question of electrical lighting for the town, and after a careful examination of the subject the committee reports that it found conditions as follows:

The rate in a number of Massachusetts towns in cents per kilowatt-hour for street lamps was:—

Cities and Towns.	No. of Arc Lamps.	Arc Lamp Rate.	No. Incandescent Lamps.	Incandescent Lamp Rate.
Brockton	266	6.6	470	4.1
North Adams	175	4.5	42	8.5
Adams	66	6.7	51	5.4
Ayer	4	8.6	102	6.5
Williamsburg	1	10.3	72	6.1
Plymouth	7	10.8	286	6.5
Gt. Barrington	—	——	229	5.3
Greenfield	60	12.6	32	12.5
Pittsfield	70	9.9	571	5.9
				7.3
Pittsfield	37	8.3	——	8.5
West Springfield	23	5.7	311	3.3

The lighting companies in all these towns are in a prosperous condition.

The rates charged for street lighting should be lower than those for private lighting because the service forms a comparatively heavy load which does not fluctuate in amount, and extends over a large fraction of each 24 hours.

The rate per kilowatt-hour for service outside of street lighting was 11.2 cents, in 1902; 9.8 cents, in 1903; and 8.1 cents, in 1904. The cost of energy during these years averaged about 3.3 cents aside from management and taxes.

The net earnings of the company increased from 8.65 per cent. of the capital stock, in 1896, to 37.20 per cent., in 1904.

The committee decided that half night lighting, or until 1 A. M., amounts to about 2,000 hours per year, a moonlight schedule to about 3,000 hours, and every night and all night to about 4,000 hours. That for the purpose of comparison that 3.5 watts may be allowed for each nominal candle power of incandescent lamps, 330 watts for a 1,200-candle-power arc lamp and 500 watts for a 2,000-candle-power arc lamp.

That all of the series lamps of the incandescent type lose their power much more rapidly than do lamps operated in multiple at constant pressure. And all of incandescent lamps as well as arc should be operated on separate circuits run from the generating station solely for this purpose.

In order to give the best distribution of light, all lamps should be suspended over the center line of the street and from 20 to 25 feet above the road.

On the main streets enclosed arc lamps should be placed 300 feet apart. On the more important side streets 50 candle-power incandescent lamps 150 feet apart, and on the less important side streets, 50 candle-power incandescent lamps, 200 feet apart.

A 50-candle-power incandescent lamp when new consumes from 155 to 190 watts, which is equal to about one-third the amount of a 6.6 ampere, or 1,200-candle-power arc lamp. If three incandescent lamps are used instead of one arc lamp, and renewed each 500 hours at a cost of 40 cents to 60 cents, the cost of renewal per lamp for a year of 2,000 hours is about $2.

Any contract for street lighting should be for electrical energy only, and should not bind the town to any particular kind of lamp, because there are liable to be inventions that will largely increase the amount of light that can be developed by a unit of energy.

The above report gives in a succinct form very many of the items that any municipal committee must regard in an investigation of this subject and shows a great amount of intelligent research on the part of Mr. Alton D. Adams and his associates in Greenfield, and it will be of value in many other places.

COST OF MAINTAINING SEWERS.— The comparative annual cost of maintenance of the sewers of Worcester, Mass., is graphically shown in a table prepared by the Committee for the years 1877-1903 inclusive. With 36.17 miles, in 1877, the cost per mile was $214.97, and from that time the tendency has been downward to $155.51 per mile for 169.13 miles of sewer, in 1903. This latter showing is not, however, so good as it should be, and would be reduced to $133.63 per mile by the deduction of bills held over from the year previous, and still lower by taking account of fact that hours of labor have been fixed at eight per day instead of nine or ten, as formerly, and with a minimum wage of $1.85.

Water Rates in English Towns

THE interesting table—translated from pounds and shillings into dollars and cents—which follows is prepared by Mr. James Carter, treasurer of the Borough of Preston, England, and gives the water rates for domestic purposes in English cities. To afford a fair comparison, houses of the same grade have been taken in the several cities, and the rates given are those per pound sterling ($4.87) on property of £15 rateable value. That is: a house in Accrington, which rents for $73.05 a year, would pay 15 times 36.53 cents, or $5.48, water rate.

The figures show an average for the 84 cities given of 29.33 cents; the highest being 48.70 cents in the three neighboring Lancashire towns of Bury, Heywood and Rochdale; the lowest, in Liverpool, of 12.18 cents. The cities below 100,000 population give an average of 30.92 cents, which decreases with the increased size of the city; for places between 100,000 and 150,000 the average is 28.41 cents; less than 250,000, 25.18 cents, and over 250,000 24.57 cents. Of the places where the profit from water is used to lower the rates, 16, or 74 per cent., are in the class of cities below 100,000 inhabitants.

Name of Town.	Population.	Water Rate. cents.	Profit from Water Paid to Relief of Rates. $
Accrington	44,500	36.53	—
Ashton-under-Lyne	45,000	46.68	3,791.20
Bacup*	22,505	36.53	—
Barrow-in-Furness	65,500	24.69	†43,830.00
Bath	49,318	24.35	4,870.00
Belfast	365,000	32.47	—
Birkenhead	114,814	20.30	14,610.00
Blackburn	130,000	34.96	—
Blackpool	55,000	36.53	—
Bolton	175,744	30.84	48,700.00
Bootle	61,600	18.27	—
Bradford	284,122	36.53	—
Brighouse	22,000	24.35	—
Burnley	99,000	24.35	—
Burton-on-Trent	51,934	35.01	—
Bury	59,000	48.70	—
Bristol	356,647	—	—
Brighton	126,286	18.27	29.220.00
Bournemouth	64,000	a22.33	—
Carlisle	46,500	24.35	30,924.50
Cheltenham	50,000	24.35	—
Chester	38,300	a40.59	—
Coventry	73,000	29.21	12,275.00
Croydon	144,000	29.61	—
Cardiff	176,310	29.61	—
Darlington	48,000	31.45	30,681.00
Darwen	40,000	38.56	—
Devonport	75,330	28.41	—
Dewsbury	28,750	29.21	—
Derby	120,440	30.44	—
Dudley	50,000	a —	—
Eastbourne*	45,750	24.35	—
East Ham	115,000	a27.39	—
Exeter	48,000	24.35	974.00
Gateshead	118,000	30.85	—
Halifax	107,000	35.78	—
Hastings	66,500	32.47	14,775.58
Huddersfield	95,000	40.59	—
Heywood	26,000	48.70	—
Islington	341,044	25.97	—
Kensington	178,500	a19.58	—
King's Lynn	20,288	25.36	—
Kingston-on-Hull	253,865	24.35	24,350.00
Lancaster	42,570	32.47	20,127.71
Leamington	27,000	18.27	—
Leeds	450,142	24.35	73,050.00
Leicester	224,189	28.41	—
Liverpool	723,430	12.18	—
Lincoln	52,000	24.35	3,652.50
Macclesfield	34,635	30.44	3,038.88
Manchester	557,938	16.24	—
Middlesbrough	99,000	30.44	—
Newcastle	225,362	a —	—
Northampton	87,021	24.35	13,499.64
Norwich	113,000	35.85	—
Nottingham	248,819	26.38	—
Nelson	36,654	30.44	3,289.85
Oldham	139,497	36.53	—
Oxford	50,000	26.38	27,832.05
Portsmouth	200,000	25.97	—
Plymouth	113,000	22.73	17,415.12
Preston	115,055	28.41	—
Reading	76,678	21.92	1,948.00
Rochdale	85,601	48.70	—
Rotherham	59,000	38.56	—
Salford	228,983	22.33	16,636.00
Southampton	112,500	22.33	—
Southport	50,500	36.53	—
Stafford	22,532	24.35	2,922.00
Stalybridge	28,000	40.59	—
Stockport	97,000	36.53	—
Stockton-on-Tees	54,000	33.48	—
Sunderland	151,000	24.35	—
St. Helens	88,740	25.36	—
South Shields	107,334	25.86	—
Swansea	100,000	26.79	—
Tynemouth	51,366	30.44	—
Tunbridge Wells	35,000	30.95	—
Wakefield	42,365	35.51	—
Warrington	67,000	29.22	—
West Bromwich	65,175	29.22	—
West Hartlepool	66,700	36.53	—
Westminster	183,011	19.49	—
Wigan	63,500	26.38	—
Wolverhampton	98,268	30.53	—
Widnes	29,000	23.01	—
York	81,268	23.34	—

* Charged on gross rental. *a* Private company. † Including profits from gas.

Storage Reservoirs of London

THE table given below shows the available storage capacity for unfiltered water in the several district reservoirs of the Metropolitan Water Board, of London, and including the Staines reservoirs reaches the total of 7,337,600,000 gallons. The deficiency in storage, on January 31, did not exceed 450,000,000 gallons. The reservoirs could not, however, be drawn on for the limit of their capacity, and the available storage should be taken at about 15 per cent. less than the figures indicate. During the building of the works for conveying Thames water to the New River district, a daily supply of 17,500,000 gallons may be drawn from the Staines reservoirs to each of the Grand Junction and West Middlesex districts, which equals a respective increase in storage for these districts of 96 and 69 days.

District.	Storage Capacity in Gallons for Unfiltered Water.	Number of Days' Storage.
Chelsea	190,000,000	15.5
East London	2,405,000,000	56.7
Grand Junction	58,500,000	3.4
Kent	——	—
Lambeth	466,500,000	15.3
New River	168,100,000	4.9
Southwark and Vauxhall	390,000,000	12.66
West Middlesex	397,500,000	16.6
Staines Reservoir	3,300,000,000	—

Municipal Improvements in California

PASADENA, CAL., lays claim to being the best sewered city, proportionately to its size, in the country. Its statistics for 1904 show a total area of $5^1/_3$ square miles with 58.11 miles of sewers. It has five miles of paved streets; 145 miles of curbing and guttering, and 92 miles of cement sidewalks. The total expense of street improvements for the fiscal year ending June 30, 1904, was $216,029, ap-

portioned as follows: Schools, $24,429; parks, $41,624; fire department, $31,184; sewers, $5,958; street lighting, $13,723; street sprinkling, $13,578; street department, $44,015, with the balance to other departments. The population is 20,000; the assessed valuation, $13,411,720, and the tax rate $1.50 per $100.

In this connection the following comparative statistics for California cities of the second class is of interest.

	Population.	Assessed Value.	Bonded Indebtedness.	Tax Rate.
San Diego	28,755	$14,387,105	$1,354,125	$1.48
San Bernardino	15,000	4,044,498	270,000	1.80
Riverside	11,000	7,019,905	136,750	1.10
Santa Barbara	10,000	6,586,613	274,874	1.30
Long Beach	9,000	4,000,000	164,000	1.20
Santa Ana	7,500	2,900,000	118,000	2.20
Santa Monico	6,500	3,400,000	85,000	1.50
Redlands	6,000	6,097,000	51,000	1.04
Monrovia	2,600	1,105,250	78,000	1.50
Pasadena	20,000	13,411,720	318,350	1.50

Electric Street Lighting*

THE first instance of public street lighting in this country was in the public square of Cleveland, a little park of about ten acres. In April, 1879, twelve lamps of the ordinary so-called two thousand candle power were installed in the park on high ornamental poles.

While we were putting up the poles and line circuit, a great deal of interest was manifested by the public, and on the evening when the lights were formally started the park was crowded with people. Many evidently expected a blinding glare of light, as they had provided themselves with colored spectacles or smoked glass. Of course, there was at first a general feeling of disappointment in this respect, although every one was willing to admit that he could read with ease in any part of the square. After a few weeks, however, when the novelty had worn off, and the people had tired of staring at the lamps, the general verdict was highly favorable to the new light.

As the public square lights were required to burn all night, this necessitated putting fresh carbons in each lamp sometime during the night, because a single set would not last until morning. But the nightly trimming of the lamps required an extra man and added materially to the cost of lighting. To meet this difficulty, I devised the "double-carbon" lamp, which afterward grew into general use for all-night lighting, and became famous through much patent litigation.

* From Charles F. Brush's "The Arc Light," in the May *Century*.

Municipal Corruption Abroad

MR. RODERICK SCOTT, a Glasgow magistrate, was interviewed by a Chicago paper a few weeks ago, and declared that there was no corruption in that city of enlarged municipal activities.

When asked about corruption in the municipality he expressed the greatest surprise: "How could there be corruption? I represent a workingman's ward. If I give one of my constituents a cigar or a drink, I am by that act itself disqualified from being a candidate. If a friend of mine lends me his carriage to take voters to the polls that is all very well, but if any friend of mine hires a carriage for the same purpose, the act, even without my knowledge or approval, disqualifies me.

"There is no political corruption in Glasgow. It is not possible under the Corrupt Practices Act, and public opinion would condemn the least sign of it.

"John Young, who has managed our municipal tramways, has recently been employed by your Mr. Yerkes to manage his railways in London. Mr. Young received £1,400 from Glasgow, but he gets £4,000 from Mr. Yerkes, with a promise of £6,000.

"Our theory in Glasgow is that any service that is a monopoly, that serves all the people and occupies the public streets, should be owned and administered by the people. Water, gas, trams and the like comes under this category. Our trams are the best system in Great Britain, and after paying all operating expenses and every obligation they net the municipality £200,000, or $1,000,000, annually."

Profits of Municipal Operation in England

UNDER date of February 22, 1905, United States Consul-General H. Clay Evans, London, transmits the following article, published in the *London Daily Express* of even date, under the heads of "Triumph of Electricity," and "Remarkable Figures as to Its Use on British Tramways." In the printed extract herewith pounds sterling have been reduced to dollars in the Bureau of Statistics.

The triumphant march of electricity, as applied to tramways and light railways, is shown in a board of trade return issued yesterday, giving the figures for street and road tramways for 1903-4, with comparatively statistics for past years.

The return covers the period from 1878 to 1903-4, and divides it into three periods—horse, steam, and electricity. The maximum year of the horse period was 1879, that for the steam period 1898, while the use of electricity is still growing. A selection from the figures given in the return shows some of the results of the new method of traction.

Length of Lines, Number of Passengers Carried, Net and Gross Receipts, Average Fare per Passenger, and Capital Invested on British Tramways, 1879, 1898, and 1903-4.

Item.	1879.	1898.	1903-4.
Miles of route open	269	1,604	1,840
Passengers carried	146,000,223	858,485,542	1,799,342,673
Passengers carried, per mile.	469,641	806,703	977,961
Net receipts.....dollars	1,123,947	5,120,682	14,171,783
Gross receipts.....do..	5,349,602	22,191,853	41,875,668
Average fare per passenger, cents	3.68	2.46	2.2
Capital .....dollars	20,475,069	80,262,547	235,788,952

In 1898, 38,777 horses and 589 steam locomotives were employed on the tramways. In 1903-4 there were only 15,353 horses and 249 steam locomotives. The places of those which have gone have been taken by 7,132 electric cars. In other words, over 1,460 miles of tramway and light railway line are now under electric traction, and only 235 under horse and 108 under steam.

Of the total of 312 tramway and light railway undertakings in the United Kingdom, 162 are now owned by local authorities, with a total of 1,147 miles of track. A total capital expenditure of £28,060,524 ($136,556.541) has been incurred by local authorities.

From the profits of these municipal undertakings a sum of £207,087 ($1,007,789) was, in 1903-4, handed over to the

relief of the rates. Among the places at which this satisfactory result was achieved were the following:

Sums Handed Over from the Profits of Municipal Tramways and Light Railways to the Relief Rates of Certain Cities.

Cities.	Paid to the Rates.	Cities.	Paid to the Rates.
Leeds	$253,058	Nottingham	$63,264
Manchester	243,325	Salford	58,398
Liverpool	134,661	Hull	55,955
Glasgow	124,662		

Other interesting figures given in the return show that the tramways and light railways paid £287,733 ($1,400,253) in rates and taxes, and that £1,239,121 ($6,030,182) was paid in dividends.

Why Water Meters Should Be Used

A COMPARISON of the relation of cost of water waste to the use of water meters afforded by extracts from the annual reports of the Board of Public Works of Milwaukee, Wis., for the year 1903, and of the Department of Public Works of the City of Buffalo, for 1903-4, affords a good argument for meters.

	Milwaukee.	Buffalo.
Number of meters in use	36,415	1,515
Population	325,000	400,000
Average daily consumption, gal	26,272,412	127,741,660
Daily consumption per capita, gal	80	319
Total number of taps	47,481	68,208
Daily consumption per tap, gal	553	1,872
Cash received for water and meter repairs	$325,275.32	$725,503.39
Total cash received	399,211.00	893,695.89
Total cost of maintenance	182,626.67	415,956.84
Less sale of taps, pipe, etc	22,996.57	33,192.50
Actual cost of supplying water	159,630.10	382,764.34
Average cost to consumer for water and meter repairs per tap	6.85	10.63
Average cost to city to supply water per tap	3.36	5.61

In 1880 the average daily consumption of water per tap in Milwaukee was 1,781 gallons with only twenty-six meters in use, which corresponds closely with the present consumpton in Buffalo.

At that time the average cost to consumers in Milwaukee was $17.24 per tap and the average cost to the city to supply water per tap was $10.53.

From this it will be noticed that the cost of water at present by meter in Milwaukee to both the consumer and the city is only about one-third what it was in 1880 without meters, which accounts for the popularity of meters in Milwaukee.

The meter rate for water in Milwaukee is 6 cents per 1,000 gallons, while in Buffalo it is 6 cents per 1,000 gallons for the first 22,500 gallons per month and 2 cents for all additional water used.

The interest on value or cost of plant or bonded indebtedness is not included in any of the above figures.

Parcels-Post Rates in Germany*

The post-office department in Germany acts as an express company and accepts packages from Freiburg for delivery at Hamburg or any other German town at the rate of 50 pfennigs (11.9 cents) per 5 kilograms (11 pounds). The rate for overweight to Hamburg is 30 pfennigs (7.14 cents) per kilogram (2.2046 pounds) extra; from places nearer to Hamburg, however, the excess rate is less, varying from 10 to 50 pfennigs (2.38 to 11.9 cents) per kilogram, according to distance.

The post-office rate from Freiburg to other coutries is as follows:

Parcels-Post Rates from Freiburg, Germany, to Foreign Countries, per 11 Pounds.

Countries.	Rates per 11 pounds. Marks.	Cents.
Algiers (French colony)	1.20	20
Austria-Hungary *a*	.50	12
Azores	1.80	43
Belgium	.80	19
Bulgaria	1.80	43
Danish Antilles *b*	1.60	38
Denmark	.80	19
Egypt	1.40	38
France	.80	19
Great Britain and Ireland	1.10 to 2.10	26 to 50
Greece	1.40 to 2.20	33 to 52
Italy	1.40	33
Luxemburg	.70	17
Madeira	1.80	43
Malta	2.00	48
Montenegro	1.60	38
Netherlands	.80	19
Norway	1.00 to 1.60	24 to 38
Portugal	1.80	43
Roumania	1.40	33
Russia	1.40	33
Servia	1.00 to 1.20	24 to 29
Spain (limit 3 kilos or 6.6 pounds)	1.40	33
Sweden	1.60	38
Switzerland	.80	19
Tripoli	1.60 to 1.80	38 to 43
Tunis	1.80 to 2.00	43 to 48

a Parcels post and letter postage rates for Austria-Hungary are the same as in Germany itself.

b Parcels for Egypt via Switzerland and Italy 52 cents per 11 pounds.

The following are the charges for parcels to the United States: One kilogram (2.2046 pounds), 33 cents; 1 to 5 kilograms (2.2046 to 11 pounds), 31 to 88 cents, according to the circumstances of sending and delivery.

In all cases certain requirements for the foreign customs department must be followed, which for the United States are, besides the card of address, two declarations pertaining to cost and contents; and as regards size, packages for the United States must not be over 105 centimeters (41.24 inches) in length, and the circumference must not exceed 180 centimeters (70.87 inches).

From 1 to 20 kilograms (2.2 to 44 pounds) the rate is 1.10 marks (26 cents). For each additional 10 kilos (22.046 pounds) or fraction thereof 55 pfennigs (13 cents), so that the rate for 100 kilos (220.46 pounds) is 5.50 marks ($1.31).

The railroad express rates are for 20 kilos (44 pounds) or less 2.60 marks (62 cents), and for each 10 kilos (22.046 pounds) additional 1.28 marks (30 cents), so that the express rates for 100 kilograms (220.46 pounds) are 12.78 marks ($3.04).

THE REPORT OF HENRY A. KNIGHT, superintendent of Street Lights, Worcester, Mass., for the year ended November 30, 1903, shows the cost per arc lamp of 2,000 c. p., per year on an all night and every night schedule, was $111.27. Gas Welsbachs of 60 c. p. on the same schedule cost $29.66, and Gasoline Welsbachs $29.59. Gasoline Welsbachs burned from dusk to 1 A. M., on moon schedule, twenty-one nights per month cost $23.33 per lamp per year.

* From United States Consul Liefeld, Freiburg, Germany.

INCIDENTAL ITEMS OF INTEREST

Many Matters of Moment to Municipalities Briefly Told—Short Record of Happenings and Facts in City, Town and Village

SOME INTERESTING FACTS ABOUT PROVIDENCE, R. I., are gleaned from the 1905 *City Manual.* The area is 18.29 square miles; population 197,000; real valuation, $164,632,920, and personal, $43,350,700; total indebtedness, exclusive of water debt, $8,937,486, with a sinking fund of $4,759,129; the tax rate is $16.50 per $1,000. There are 238 miles of streets, 192 miles of which are of gravel or crushed stone; 31 miles are paved with granite blocks; five miles with cobble stones, and six miles with brick, asphalt and vulcanite. The streets are lighted with 1904 arc lights, which cost $109.50 per year each. There are 19 parks containing in the aggregate 570 acres. In his annual message, Mayor Miller suggests a municipal electric lighting plant, as the contract with private company will expire soon.

THE WATER DEPARTMENT OF MANKATO, MINN., shows the following results for the year 1904. The cost of the plant to date has been $128,160.56, for which there are now outstanding bonds to the amount of $87,000. The total cost of operation for the year, including repairs and maintenance, was $8,332.07. Interest on the bonds, amounting to $4,005, is paid from the general tax fund as an offset to free water for city uses, estimated at $8,682. The receipts from water rents and sales and from a 5-cent frontage tax amounted to $10,339.34, leaving a net profit of $2,007.27, in addition to $4,677 of benefit to the city on the free water. There are 945 meters in use and the number of gallons consumed during the year was 331,549,000, or about 75 gallons per capita a day.

THE WATER COMMISSIONERS OF ST. PAUL, MINN., give the following statistics in their report for 1904. The total net cost of the city water plant to be $4,303,863.38, of which $1,843,863.38 has been paid from surplus earnings and the balance by bond issues. There are $2,367,000 in bonds outstanding bearing $109,665 interest charge, and $694,217.30 in the sinking fund. The receipts for the year were $387,853.45, and expenditures $390,528.03. During 1904, there were laid 5.76 miles of mains, increasing the total to 268.90 miles. And the average daily consumption of water was 9,619,107 gallons, or about 50 gallons per capita. The number of meters in use is given at 7,909, and the average per month for 100 cubic feet of water was $0.0784. The average number of gallons pumped for each pound of coal consumed was 642.8.

FACTS ABOUT SCHENECTADY.—Schenectady, N. Y., has a population of 57,000 and an assessed valuation considerably over $12,500,000. Its fire department is ample and efficient, having 373 men, paid and volunteer; ten companies, nine houses, six combination wagons, one chemical engine, two steamers, two trucks, two hose wagons, 18,000 feet of hose, sixty-one fire alarm stations, forty-five miles of wire and thirty-two horses. The police department comprises fifty-six men and four stations, one patrol wagon and one mounted officer. The paved streets aggregate about forty-five miles, as follows: Asphalt, twenty-eight miles; asphalt block, four miles; brick, five and one-half miles; granite block, two miles; other kinds, about five miles. There are in the city twenty-one public schools and one public park. The city tax rate is 25.5 on each thousand dollars valuation.

MUNICIPAL TELEPHONES IN CANADA.—Port Arthur and Fort William have municipal telephones which have been satisfactory in every way. The two towns are so closely situated to each other and so connected by trolley as to make them and the system almost one. The system was inaugurated in 1902 and there are now in operation 500 instruments in Fort William and 511 in Port Arthur. The charges for service are $12.00 a year for telephones in residences and $24.00 for those in business houses. The cost of the two systems was $31,000 for Fort William and $21,000 for Port Arthur, and there was a deficit of $576 in the first year which, in 1904, was made up and a surplus of $459 shown.

STREET SPRINKLING IN HARTFORD, CONN., is done by contract, and, since 1899, the average total cost has been $23,633.37, ranging from $20,886, in 1899, to $26,369, in 1900, or from $470.73 per mile to $556.30, and the average cost per square yard for the season of 1903 was 83.63 cents. New streets are added to the territory covered on petition by the abutting property owners.

THE DISPOSAL OF SEWAGE.—The report of the Committee on Sewers of the city of Worcester, Mass., for the year ended November 30, 1903, is interesting in its treatment of the disposal of sewage. The average daily flow of sewage received at the purification plant was 15.55 million gallons, amounting to a total for the year of 5,676 million gallons, of which 5,251 million gallons were treated with chemicals, 158 million gallons by the septic process, and 267 million gallons by sedimentation before being filtered. The sewage showed .832 parts per 100,000 parts albuminoid ammonia. The chemical treatment consists of adding milk of lime to the sewage at the ratio of 871 pounds of lime to one million gallons of sewage. The precipitate formed by the lime and the suspended matter in the sewage are allowed to settle to the bottom of the basins and the clarified water then flows away. Lime is added to the sludge, which is pressed and drawn away to the dump. The total cost is $8.92 per million gallons, and the total annual cost is $0.41 per capita on an estimated population of 132,000.

THE AVERAGE COST PER SQUARE YARD of new traprock macadam, laid to a depth of eight inches, in Worcester, Mass., in 1903, was $0.79; traprock resurfaced was $0.198; native macadam, new, $0.752, resurfaced, $0.104.

THE COST OF MACADAM PAVEMENTS, and the expense of repairs to such pavements is shown for the city of Meriden, Conn., in the report of the Board of Public Works. From 1899 to 1904 there has been a total of 78,444 square yards of macadam laid including the gutters, the cost ranging from $0.358, in 1898, to $0.553, in 1900, the average being $0.454 per square yard. During the past year there have been 53,591 square yards of macadam repaired at an average cost of $0.00404.

THE CITY AND COUNTY DEATH RATE IN CONNECTICUT is compared in the annual report of the State Board of Health for 1904. The number of deaths per 1,000 population in towns of 5,000 or more inhabitants has ranged, during the past ten years, from 15.75, in 1899, to 17.92, in 1896, with an average of 16.25. In towns of less than 5,000 inhabitants the greatest number of deaths per 1,000 population was 18.19, in 1900, and the least was 14.34, in 1902, with an average for ten years of 16.01. The average of the eight largest cities in the State for ten years has been 16.03. In the small towns the mortality is greater in the winter months, while in the large towns the summer months are more fatal. The uniformity of the figures extending over a series of years is, however, remarkable.

ELECTROLYSIS IN BAYONNE.—Bayonne, N. J., is having trouble with water mains affected with electrolysis. A line of 840 feet of 6-inch main was recently found to be a total loss, and now about 1,500 feet of 12-inch main is found to be practically ruined. Examination has been made by an electrical expert and the escaping current traced to the power house of the street railway company. Action will be taken by the city to compel the company to install a copper return system instead of relying, as at present, on ground return, and suit will be brought to recover the damage already sustained and establish the liability of the trolley company for any future damage.

PUBLIC SCHOOLS MUST PAY FOR WATER IN TOLEDO, OHIO, or make a radical reform in the matter of waste. In Cleveland an allowance is made equal to ten gallons per day per child for the average attendance and beyond this amount the school board must pay for water consumed, and a similar arrangement is recommended for Toledo. The net profits of the water department for 1904 were $115,476; the average daily pumpage was 10,894,357 gallons.

WATER SUPPLY OF TAUNTON.—The report of 1904 of the Water Commissioners of Taunton, Mass., shows a total distribution of 554,644,539 gallons of water, or 320 gallons per day to each tap in use, or 49 gallons to each inhabitant. The average daily consumption exceeded 1,500,000 gallons. Cast iron pipes are used exclusively, of which there is a total mileage of 80.59; repairs and maintenance for 1903 cost $28.61 per mile.

NEW BRITAIN, CONN., IS RELAYING WATER MAINS and making them of larger size. Small pipe was laid from 30 to 40 years ago which has proven insufficient for the need of the present, and last year 1¼ miles of six and twelve inch pipes were laid to take the place of smaller sizes.

THE USE OF WATER METERS IS BEING EXTENDED IN SPRINGFIELD, MASS., and under a new ruling the consumer may change at once to the meter system, the city providing the meters at a cost of $9.50. Under the former system the change from the regular water rate could be made but once in six months.

MUNICIPAL WATER-WORKS FOR PASSAIC, N. J., is forecasted by a resolution, unanimously adopted by the city council, directing the city attorney and the city engineer to report on the feasibility of constructing a municipal plant. In introducing the resolution, Councilman George K. Rose presented letters from 35 cities, in 29 of which there are municipal plants, and all reported to be highly satisfactory to the consumers. The present contract between the city of Passaic and the Acquackanock Water Company does not expire until 1909, but it is claimed that the company has violated the terms of the pact in the matter of charges.

MUNICIPAL GAS FOR THIRTY-THREE CENTS per 1,000 cubic feet is the proposition before the city council of Montreal, Canada. The report of a committee appointed to investigate the gas question shows that gas can be manufactured for 26 cents per 1,000 feet, and a charge of 63 cents the first year reduced to 48 cents the tenth year, and 33 cents the twentieth year and thereafter, will pay for the cost of the plant and its operation and maintenance.

BRUNSWICK, MAINE, IS TO HAVE PURE WATER, and will be the first town in the State to draw water from driven wells. The system just installed affords a supply of 2,000,000 gallons daily pumped from 50 wells driven in a territory of about 25 acres. The analysis of the water shows it to be almost perfectly pure. The system of driven well supply is advocated by the Massachusetts Board of Health as water from such a source is subjected to ground filtration which is better for purification than any known artificial system.

THE WATER SUPPLY OF WESTMOUNT.—The special committee appointed to examine the water supply question for the city of Westmount, Canada, find that the supply is taken by the company from which the city receives its water from a point in the St. Lawrence where the river receives quantities of sewage from vicinity cities; that the intake pipe is poor and the quality of water is bad, and was probably the result of the serious epidemic that broke out in the city a year ago, and that the pressure is not sufficient for fire purposes. A municipal plant, costing $700,000, taking water just below the Lachine rapids is foreshadowed, which can be financed to pay for itself at present rates by an issue of 40-year bonds. The council is also arranging for a municipal lighting and incineration plant, and has made an appropriation for a tract of land for the proposed station.

Motor Fire Engine in London*

LONDON has shown less interest in the motor fire engine than in the motorbus. Steam-propelled fire engines are in use in Liverpool, Brighton, Plymouth, P ortsmouth, and other English cities, and have given reasonable satisfaction. But London has until the present time tried only one adapted machine of this kind. Now, however, it claims to have the largest and most powerful motor fire engine yet built. It is of 50 horse-power and capable of throwing 500 gallons of water a minute to a height of 150 feet. It is propelled by a steam water-tube boiler situated between the rear wheels. It is heated by a petroleum burner of new design, in which the fuel is sprayed into the furnace. This gives a very hot fire, which can be regulated with nicety. In front of the boiler is the engine, with a pair of inverted cylinders driving two direct and double-acting pumps. The pumps can be disconnected from the engines in a few seconds, and by throwing into gear a pinion wheel the motor drives a countershaft, from which the power is transmitted by chains to the wheels. Thus the same motor takes the vehicle to the fire and on arrival pumps the water. The engine carries enough petroleum for a 40-mile journey, and as a fresh supply of fuel can always be obtained at the scene of a fire the machine can keep going for a week if necessary. The engine is steered by handwheel. It is fitted with single solid rubber tires and "non-skids," as the risk of side slip on the roads of the metropolis must be taken into account.

A demonstration of this motor fire engine's capability was made a few days ago. First of all it was run up Blackheath hill. This has a gradient of 1 foot in 9 or 10 feet at the steepest part, and horsed fire engines go up at a walk, with the men on foot. The motor engine went up with a full load of 8 men, hose, and appliances at the rate of 15 miles an hour under a full head of steam, and was gathering speed on the stiffest part of the climb.

This motor fire engine will be put into service at once. It is not claimed that it will save time in the "turn out," although only a minute is necessary to get up steam enough for running. A small gas jet is kept burning under the boiler while it is standing in the station so as to maintain the water fairly hot, and this will give sufficient steam to start the petroleum burner at full power, and a good pressure in the boiler quickly follows. For country districts, where journeys to fires are often long, the motor fire engine must effect a great saving in time. To small places, which can not afford to keep horses always ready for their engine, in view of the rarity of fires, the motor engine, which costs little when it is not running, will be a boon.

* From United States Consul Hamm, Hull, England.

Fine Fiddles Made By a Cop

POLICEMAN George Warner, of the Binghamton, N. Y., Police Department, has made four violins out of an old washstand, which by their excellence surprise the local musicians. The achievement is the more surprising as Warner is not a musician himself.

Warner has been on the police force for twelve years. Before that he was a farmer and carpenter. Last summer he wanted his fourteen-year-old son, Chauncey, to take violin lessons, and looked around for a violin. Good violins cost more than he could afford to pay.

"I was always handy with tools," said he in telling of his experience. "When I worked at carpentering I built several houses, and one time I wanted a special kind of a skeleton wagon to break a team of colts. I could not find anything that was just what I wanted, so I set to work and made me a wagon, and it was a good one, too.

"When I couldn't find the kind of a violin that I wanted for Chauncey without paying several hundred dollars, I says to myself: 'You've built houses and you made that wagon. Why can't you make a good violin?' And so I set to work."

He hunted around the second-hand shops until he found a curly maple washstand, about a hundred years old. Then he went to a house that has been built for over ninety years and obtained one of the pine attic steps from which to make the front of his violins. Then he began work.

He did not even have a pair of calipers to gauge the thickness of the wood, but determined when he had obtained the proper thickness by feeling the wood between his fingers and looking through it at a lamp. The work was all done at night when he was off duty.

He whittled and gouged and scraped until he had his pieces reduced to the proper shape for his first instrument. Then he obtained assistance to glue the violin together.

After several weeks the instrument was completed, and after it was thoroughly dried, Warner took it to Professor Pultz, the Owego violinist, from whom his soon took lessons. On trying the instrument Professor Pultz would not at first believe the story of its manufacture. Its tone surprised him, being rich, clear and strong.

Having succeeded so well, Warner made three more violins. When they were taken to Professor Pultz for trial he was more surprised than at the first one.

Fire Engineers' Hand Book

WHEN a business concern publishes in its booklets a lot of useful information to those persons who would naturally be its patrons, it demonstrates the highest knowledge of human nature and the best methods of publicity. Such literature is always welcome to the parties interested and THE MUNICIPAL JOURNAL will always take pleasure in calling attention to it. For this reason it would call to the attention of fire commissioners and the rank and file of all fire departments in the country the 48-page booklet issued by the Fabric Fire Hose Company, of New York. It is rightly named the "Fire Engineers' Hand Book," for it contains valuable information concerning hydraulics, such as tables of "the capacity of cisterns and tanks, computed in barrels of thirty-one and a half gallons"; "work done by and power required for power streams"; "pressure of water" and others. Besides it contains six chapters about "first aid to the injured," including, "the first things to do," "unconsciousness or insensibility," "electricity accidents," "burns and scalds," "sprains and dislocation," and "suffocation." The book is in handy form, and will be sent to the address of any fireman or other interested person, free of charge. Address the company at its New York office.

Meeting of Municipal Electricians

THE announcement of the tenth annual meeting of the International Association of Municipal Electricians, to be held at Erie, Pa., August 29-31, 1905, is made by Secretary Frank P. Foster. Papers upon the following subjects will be read and discussed:

"Electrical Induction, Its Effects and the Application of Methods Used to Counteract It."

"Advisability or Inadvisability of Fusing Fire and Police Telegraph Boxes."

"Suggested Improvements in Fire Alarm Telegraphs."

"Underground Construction."

"The Necessity of a Rigid Inspection by the Municipality."

"Electric Light Engineering."

"Electric Light Plants."

These papers have been assigned to men who are thoroughly conversant with the subjects selected. The subjects are of great importance to the municipal electrician who wishes to keep posted up to the times. There are many reasons why every city electrician should join the association if he has not already done so. Application blanks will be forwarded you by the secretary if you will kindly make the request, and also any questions you may wish to have answered; send them in and they will be assigned to some one who is an authority in the line of the question.

The papers that have been presented in the past are available to all members, and cover almost the entire field of the city electrician, or superintendent of fire or police telegraph.

The officers of this association are: Walter M. Petty, president, Rutherford, N. J.; J. B. Yeakle, first vice-president, Baltimore, Md.; G. H. Holderman, second vice-president, Indianapolis, Ind.; C. E. Diehl, third vice-president, Harrisburg, Pa.; Charles Greenwald, fourth vice-president, New Brunswick, N. J.; Frank P. Foster, secretary, Corning, N. Y.; G. F. Macdonald, treasurer, Ottawa, Can.

What Fire Protection Costs

THE cost of fire protection in many of the smaller cities of the United States, as shown in the table below, will interest many of the readers of THE MUNICIPAL JOURNAL

	Population.	No. of men.	Cost.
Galveston	33,000	53	$58,500
Sacramento	33,000	62	43,000
New Britain	33,000	61	24,000
Pittsburg	35,000	94	37,000
Lexington	35,000	37	46,000
Salem	36,000	96	37,000
Canton	38,000	41	40,000
Quincy	38,000	48	33,500
Davenport	40,000	36	38,000
Dubuque	40,000	40	35,000
Pawtucket	43,000	53	46,000
Augusta, Ga.	43,000	62	57,000
Elmira	37,000	40	38,000
Chattanooga	45,000	42	47,000
Sioux City	45,000	36	33,000
Covington	46,000	37	39,000
Lincoln	47,000	32	33,000
South Bend	50,000	55	45,000
Terre Haute	50,000	54	$45,000
Mobile	50,000	32	40,000
Elizabeth	52,000	100	57,000
Norfolk	55,000	70	62,000
Ft. Wayne	55,000	61	63,000
Schenectady	56,000	62	68,000
Knoxville	50,000	39	30,000
Utica	61,000	65	68,000
Charleston	65,000	98	52,000
Saginaw	60,000	47	38,000
Houston	70,000	65	74,000
Peoria	70,000	66	76,000
Nashville	100,000	86	100,000
St. Joseph	105,000	69	78,000

Fire and Police Personals

—Secretary Henry A. Hills, of the International Association of Fire Engineers, is reported as convalescing from a recent illness.

—James E. Taggart has been elected a member of the Board of Metropolitan Police Commissioners of Jeffersonville, Ind., to fill the vacancy made by the resignation of Horace Dunbar.

—The Fire Department of Leicestershire, N. Y., recently elected J. C. Banks, as Chief, and C. H. Hahn as first assistant. J. M. Kennedy was chosen President of the Board.

—The Fire Underwriters of New York City are inclined to over-rule Chief Croker's objections to the proposed auxiliary fire mains. It is expected that work on the new mains will begin some time this summer.

—Mayor Talcott, of Utica, has appointed Melville C. Brown to succeed P. J. Farley as Police and Fire Commissioner. In referring to this appointment the Utica "Press," in an editorial, says: "The selection is one which will meet with the approval of an overwhelming majority of Utica's citizens."

—Chief William H. Aungst, of the Alliance, O., Fire Department, reports that plans are preparing for a new central fire station in his city and he wishes to receive propositions from firms who make fixtures such as poles, door trips, stable appliances, electric door openers and special trap doors for sliding poles.

—Benjamin W. Wells, is the new Fire Commissioner of Boston. Mr. Wells was born in Boston in 1861, graduated from Harvard, class of '84, organized the U. S. Fire Signal Company in 1890, becoming its general manager and treasurer. His appointment to this responsible position is looked upon with favor both by the citizens and firemen of the department.

—Captain Henry Adams, who, for so long a period has been in charge of the training school of the New York Fire Department, now lies in the Presbyterian Hospital, seriously ill, from a paralytic stroke. Captain Adams has trained all the men of the New York Fire Department during the last twenty years, and not a few firemen from other cities in the United States have spent a month or two in his school for the sake of receiving his instruction. His many friends will regret to learn of his illness.

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books—What the Magazines and Reviews Have to Say about Civic Affairs—Municipal Reports Received

Books

A Handbook for Superintendents of Construction, Architects, Builders and Building Inspectors. H. G. Richey, Superintendent of Construction U. S. Public Buildings, John Wiley & Sons, New York. $4.00. The author has endeavored, in preparing this book, to produce an up-to-date help for those engaged in building construction. He recognizes most fully the advances and changes which occur from year to year and that a compendium is but a milepost, but his work is as valuable and necessary as a time saver to the builder as is Trautwine to the surveyor, or any other of the multum in parvo pocket books to practical men. He has had recourse to all the earlier digests on the subjects of architecture; building construction; excavations; foundations; stone cutting, laying and setting; lime, sand, cement, mortar, and concrete; fireproofing; painting, and all the various branches of the heating, water and electricity.

Another valuable feature of the work is the extracts from the latest building codes of various cities, including New York, Philadelphia, Chicago, Baltimore, Cleveland, San Francisco, and, too, the National Board of Underwriters.

Iron and steel construction is extensively dealt with as its importance in modern building requires, and tables of tests are reproduced *in extenso* showing safe loads, tensile strength and torsion strains on round bars and I beams of all sizes and thicknesses.

Cement, concrete, and fireproofing are thoroughly treated so far as present day advancement permits and every late test is brought to bear on the results given.

Electricity goes into every modern building and has become a matter as necessary of consideration as nails or glass, and in no place can more practical information, as to wiring for incandescent lamps, resistances of copper wires, etc., be found.

Heating is extensively, even exhaustively presented. All the data regarding steam, hot water and other systems are given and the reasons why in each case, enabling the contractor to turn at once to the table and know just what he must require from the sub-contractor.

The two final chapters are devoted to general short-method processes for all kinds of construction, and the whole is carefully indexed and thus made convenient for ready reference. The book may be recommended without reserveration.

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Report of a Fire, Load and Water Test made upon a 20 x 22-foot span, hollow tile groined arch floor, at the testing station of the National Fireproofing Company, in Pittsburg, Pa. The test was under the supervision of Ira M. Woolson, E. M., of Columbia University, and was designed to show the merits of this construction to be used in the floor system in the new Pittsburg Terminal Warehouse and Transfer Company, in which there are to be 800,000 square feet of floor space divided into spans the same as this.

The floor, as tested, constituted the roof of the building and formed a groined arch of 6-inch hollow tile with a 17-inch rise at the crown, and 18 inches at the haunches above the tile was a concrete filling of about 4-inch over the crown and 18 inches over the haunches. Two 8-inch I beams were put in at the middle and meeting at the center and were cambered to the curvature of the arch, thus dividing the test floor into four equal parts.

The floor was heated to an average of 1725.4° during four hours and was then subjected to a stream of water at 60 pounds pressure, for ten minutes. The maximum drop of the arch during the test was 0.04 ft., and on being loaded after the test to 1,000 pounds per square foot, the maximum deflection of 1½ inches. The tile and concrete stood the test satisfactorily showing no signs of cracking.

♣

The Future of Road Making in America. By Archer Butler Hulbert. Volume 15, Historic Highways of America Series. Cloth, 8vo. 211 pages. The Arthur H. Clark Company, Cleveland, Ohio. 1905. The author has gathered together in this volume the opinions of a number of specialists on the subject of road making, and in addition to his own contribution devotes chapters to "Government Co-operation in Object-lesson Road Work," by Martin Dodge; "Good Roads for Farmers," by Hon. Maurice O. Eldridge; "The Selection of Materials for Macadam Roads," by Prof. Logan W. Page, and "Stone Roads of New Jersey," by E. G. Harrison.

♣

A Manual of Corporate Management containing Forms, Directions and Information for the Use of Lawyers and Corporation Officials, by Thomas Conyngton of the New York Bar. New York, The Ronald Press, 1904. Law Sheep, 8vo., 350 pages. Price $3.20.

This is a reference book for corporation officials, as well as for lawyers, and treats in concise and plain language of the preliminary steps and the methods of conducting a corporation. It is more a book of directions than one of law, and is of the greatest value to corporation officers, and should be found in the library of the president, on the table of the directors and at the elbow of the secretary. The forms given cover the entire field of ordinary corporate procedure, and are copies of actual documents, rather than blanks, which are frequently so puzzling. The comments are clearly stated and non-technical. The type is large and the cross-references and index render it easy to turn to the exact section desired. The author has produced a book that is eminently practical and in which the information given is more complete and more accessible than in any other volume.

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL, or elsewhere, will be sent to any address on receipt of price.

Cement and Concrete, by Louis Carlton Sabin, B. S., C. E., Assistant Engineer, Engineer Department U. S. Army. New York, McGraw Publishing Company. Cloth, 8 vo., 507 pp. Price, $5. Within a score of years the use of cement in building and engineering undertakings has grown to occupy a place of prime importance and yet there has been developed during this time but little knowledge of the laws which govern its action. The use of the material has far outstripped the scientific investigation of its properties, and even the proper method of applying tests to determine its merit is in dispute.

The literature relating to Portland cement is almost wholly confined to discussions in the technical periodicals so that the student must either commend an extensive library or depend upon practical experience for his knowledge.

Recognizing this condition, Mr. Sabin has accepted it as the *raison d'etre* of his book, and has laboriously and exhaustively collected the material and arranged it in an accessible and logical manner. He makes no pretense to originality in the facts stated and merely digests the results obtained by those who have made investigation. He is careful to illustrate by records of methods employed in actual building each principle set forth, and to supplement each class of work in which cement is used by specifications and costs.

From the author's plan, as has been indicated, it can be at once assumed that the physical side of the question is treated much more fully than the chemical side, and many questions to which engineers could wish for answers—such as the effect of coloring matter, and of various oils, etc., on cement—are not treated satisfactorily.

The book has a very positive value, however, in giving the results attained, and so well arranged as to be capable of ready reference, and its value is enhanced by the fact that it is the only book yet published to cover the ground so completely.

♣

Hon. John De Witt Warner has contributed an article to *The Independent* of March 9, 1905, on the Subways of New York, in which he details the history of the legislation to secure additional means of rapid transit in the city and illustrates the manner in which honest efforts for a great and necessary public utility have been diverted by the greed of gain. His story is told plainly and is entirely devoid of the vermilion color attaching to such writers as Lawson, but it is none-the-less suggestive of the avariciousness of the time, which applauds acquired wealth without questioning the methods employed in securing it. In the mad rush for dollars, men of to-day limit their morality to avoiding to transgress statute laws; they say to themselves, "all these have I kept from my youth up," and, therefore, claim righteousness.

From the facts recited by Mr. Warner it is seen that the clearest forecast of the situation and the best suggestions for solving the great problem of transportation in the metropolis have come not from the Citizens' Union or other reform bodies, nor from the Chamber of Commerce, but from the labor unions, which leads to the belief that civic honesty and capacity still exists among the common people, and that they may be trusted in the management of municipal problems.

♣

The International Association of Municipal Electricians held their ninth annual convention at St. Louis in September, the official report of which is just published and contains the papers read and the discussions which followed in full. The papers on "Street Lighting," by A. S. Hatch, of Detroit, and on "The Limitations of the Telephone for Fire Alarm Purposes," by Adam Bosch, of Newark, N. J., are of especial value to city officials.

♣

Corporate Organization, Principles and Procedure. By Thomas Conyngton, of the New York Bar. New York, The Ronald Press. Sheep, 352 pages; price $3.00. This work is intended as a digest of the laws of the several states affecting the formation and conduct of corporations and illustrates the advantages obtainable under corporate form and the *modus operandi* of securing incorporation under the state laws together with the methods of procedure after organization. It is one of those law books which, while of value as a ready reference to a practicing attorney, is of greater importance to an official of an organized company. For in this age of corporations and trusts a general knowledge of the laws appertaining to their formation and management is almost as essential to a man of affairs as education in the "three R's."

♣

The Laboratory for the Testing of Road Materials at Columbia University. By A. Black, C. E. Paper, 28 pages.

The laboratory for testing materials employed in road construction at Columbia University has been conducting tests for several years on the qualities, viz.: hardness, toughness and cementing properties, required in good road stone. Abrasion tests are made by placing a given amount of broken stone, which has first received a thorough washing, in a tilted cylinder that is revolved at a rate of 2,000 revolutions per hour for five hours. At the end of the time the dust that has been ground off is sifted and carefully weighed, and the numerical value of the abrasion is then stated either in weight or percentage. The cementation test is performed by making briquettes of a standard size from the pulverized dust of the stone and submitting them to hammer blows in a specially adapted machine. The number of blows required to break the bond of cementation represents the binding power of the stone. The test of toughness is made on rock cylinders with the impact machine used for testing cementation, except that the plunger has a spherical face, instead of a flat face, and the number of blows required to cause failure represents the toughness. In making tests of samples of rock at the laboratory, the microscope is frequently used, and the amount of absorption, the specific gravity and weight per cubic foot is determined in the usual manner, while compression tests, to show resistance to crushing, are determined in pounds to the square inch.

The laboratory also contains the necessary apparatus for testing paving brick, and paving blocks of stone and wood.

Articles in American Periodicals

Municipal Ownership and League Organization, by Wolstan R. Brown, New York, N. Y., appears in *The Arena,* March, Trenton, N. J.

An illustrated article on *The Sewage Disposal Works at Saratoga,* N. Y., by F. A. Barbour, Member of the Boston Society of C. E.; and an illustrated article on *Concrete-Steel Construction,* by C. A. P. Turner, Member of the Engineers' Club of Minneapolis, and read by him before the club, October 31, 1904, appears in the *Journal of the Association of Engineering Societies,* February, Philadelphia.

Artesian Flows from Unconfined Sandy Strata, by Myron L. Fuller, U. S. Geological Survey, Washington, D. C., and *A Large Concrete Pier with a Sheet Pile and Canvas Cofferdam,* by James C. Hain, Engineer of Masonry Construction, Chicago, Milwaukee and St. Paul Railway, appear in the *Engineering News,* March 30, New York.

The following articles appear in the *Journal of the New England Water Works Association,* for March, 1905, 715 Tremont Temple, Boston, Mass.: *Hydraulic Compressed Air in Connecticut* (illustrated), with discussion, by J. Herbert Shedd; *The Direct Pumping Method of Water Supply in Use at Taunton, Mass.,* by George A. King; *Haskell's Brook Reservoir and Dam, Gloucester, Mass.* (illustrated), by Herman W. Spooner; *Description of Concrete-Steel Water Tower and Standpipe at Fort Revere, Hull, Mass.* (illustrated), with discussion, by Leonard S. Doten; *Water Tank and Tower for East Providence, R. I.* (illustrated), with discussion, by F. M. Bowman; and *The Advantage of a Scientific Basis for Determining the Value of Fuels,* with discussion, by Henry J. Williams.

The Government of a Great City, by W. Rodman Peabody, appears in *The Forum,* April-June, 1905, New York.

The New Gravity Water Works at Hudson, N. Y. (illustrated), and *The Strength of Reinforced Concrete* (illustrated), appear in *The Engineering Record,* April 1, New York.

Modern Arc Lamps, an illustrated article by John Howatt, appears in the *American Electrician,* April, New York.

Largest Electric Power in Maine (illustrated), *Electrical World and Engineer,* April 8, New York.

The Remaking of Boston (illustrated), by Rollin Lynde Hartt, *The World's Work,* April, New York.

Shall New York Own Its Subways? by R. Fulton Cutting, Chairman of the Citizens' Union, New York, *The Outlook,* April 15, New York.

British Refuse Destructors, Engineering News, April 13, New York.

The Torresdale Conduit, by John W. Hill, Chief Engineer, Bureau Filtration, Philadelphia, an illustrated article in the *Journal of the Franklin Institute,* April, Philadelphia; and in the same issue an article on *The Inspection of Electrical Conductors with Especial Interest to Fire Protection,* by Washington Devereux, Electrical Engineer to the Philadelphia Fire Underwriters' Association.

A Field for the Illuminating Engineer, by L. B. Marks, *Electrical Review,* April 15, New York.

Ice at the Intake of the St. Louis Water Works (illustrated), by Edward E. Wall, Principal Assistant Engineer, Water-Works Extension, *The Engineering Record,* April 15, New York.

Articles in Foreign Periodicals

The Municipal Works of Clerkheaton, by C. Lund, surveyor to the Urban District Council, is an article in *The Surveyor and Municipal and County-Engineer,* March 24, London, England.

The Liability of Vendors of Infected Food is an interesting article by C. E. Allen, M. A., LL. B., Barrister-at-Law, appearing in *Public Health,* April, London, England; also in the same issue will be found *The Reform of the Milk Supply,* by G. F. McCleary, M. D., D. P. H., Medical Officer of Health of the Metropolitan Borough of Battersea, a paper read before the Incorporated Society of Medical Officers of Health; *A Pure Milk Supply* (illustrated), by A. J. Laird, M. D., and read before the North-Western Branch; *The Dangers of Faultily Constructed Milk Shops* (illustrated), by William Robertson, M. D., D. P. H., Medical Officer of Health for Leith; and *The Action of Formalin on Milk and Rennet,* by Dr. Ernest Lowenstein, Berlin, translated by Dr. R. K. Brown.

Softening Water for Railway Use is an article made up from extracts from the report of the Water Service Committee of the American Railway Engineering and Maintenance of Way Association, and is published in *The Canadian Engineer,* April, Toronto and Montreal.

Public Documents Received

Annual reports of Norwich, Conn., for 1903-4. Hon. Charles F. Thayer, mayor.

Annual report of Fire department of Charleston, S. C., for year 1904. O. G. Marjenhoff, chief.

Annual report of Comptroller, St. Paul, Minn., for 1904. Louis Betz, comptroller.

Annual reports of Aurora, Ill., for 1903. Hon. John M. Raymond, mayor.

Report of Public Inquiries department of United States Department of Agriculture, for 1904. Hon. Martin Dodge, director.

Annual reports of City Auditor and Sinking Fund Commissioners of Pawtucket, R. I., for 1904. George M. Rex, auditor.

Annual report of Board of Public Works, Pawtucket, R. I., for 1903. William H. Barclay, commissioner.

Annual report of City Treasurer, Central Falls, R. I., for 1904. Charles A. Reynolds, city treasurer.

Twenty-eighth annual report of Water Commissioners, Taunton, Mass., for 1903. George A. King, superintendent.

Annual report of City Engineer, Providence, R. I., for 1903. Otis F. Clapp, city engineer.

Fifty-eighth annual report of City Auditor, Providence, R. I., for 1904. Philip S. Chase, city auditor.

Annual report of Board of Public Works, Pawtucket, R. I., for 1903. William H. Barclay, commissioner.
Bryan F. Mahan, mayor.

THE CONSTRUCTION OF SEWERS

George M. Price, M. D., Medical Sanitary Inspector of the Department of Health of New York City, in a recent "Handbook on Sanitation," published by John Wiley & Sons, of New York, makes the following pertinent suggestions about the construction of sewers:

"The most common material of which sewers are manufactured is earthenware, 'vitrified pipes.' Vitrified pipes are manufactured from some kind of clay, and are salt-glazed inside. Good vitrified pipe must be circular and true in section, of a uniform thickness, perfectly straight, and free from cracks or other defects; they must be hard, tough, not porous, and have a highly smooth surface.

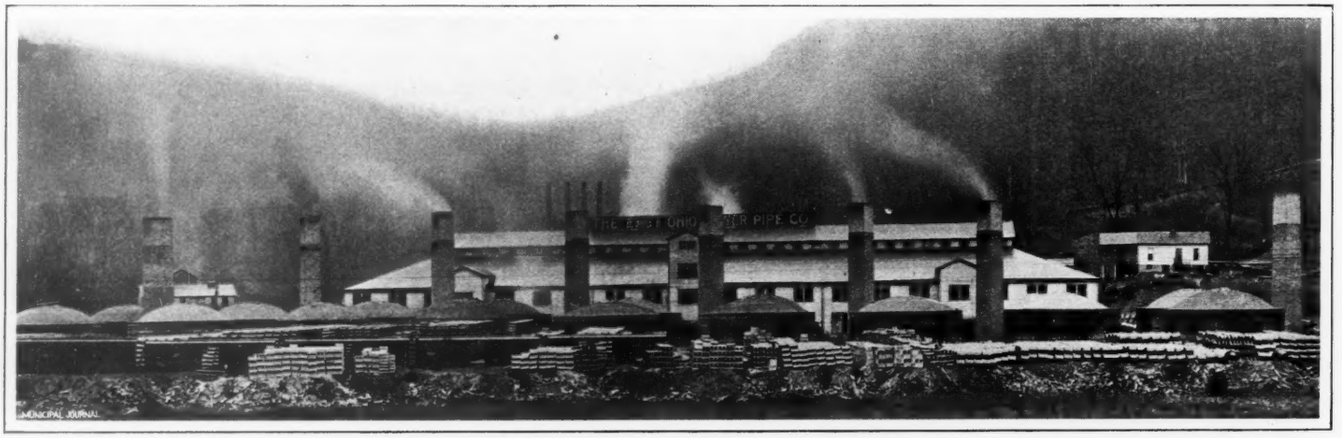
"The level of the trenches in which sewers are laid should be accurate, and a hard bed must be secured or prepared for the pipes to lie on. If the ground is sandy and soft, a solid bed of concrete should be laid, and the places where the joints are should be hollowed out, and the latter embedded in cement.

"The joints of the various lengths must be gas-tight, and are made as follows: Into the hub (the enlargement on one end of the pipe) the spigot-end of the next length is inserted, and in the space left between the two a small piece, or gasket, of oakum, is rammed in; the remaining space is filled in with a mixture of the best Portland cement and clean, sharp sand. The office of the oakum is to prevent the cement from getting on the inside of the pipe. The joint is then wiped around with additional cement.

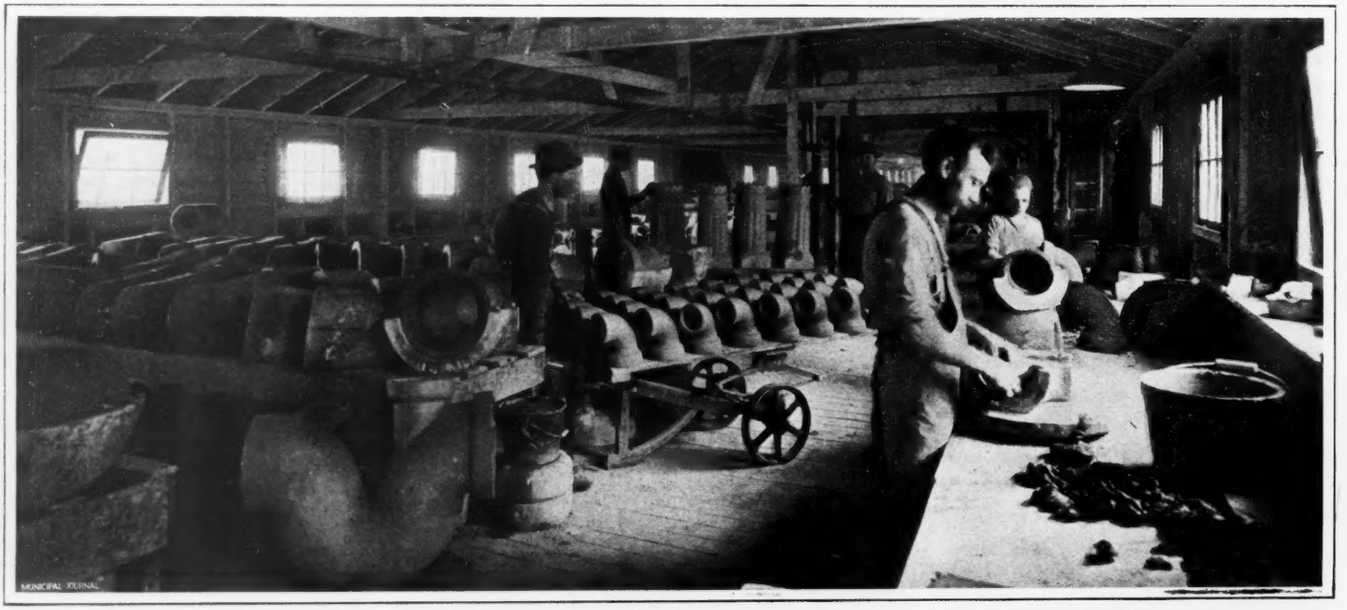
"In order that there should be a steady and certain flow of the contents of the sewer, the size and fall of the latter must be suitable; that is, the pipes must be laid with a steady, gradual inclination or fall toward the exit. This fall must be even, without sudden changes, and not too great or too small.

"In order for the sewer to be self-cleansing, its size must be proportional to the work to be accomplished, so that it may be fully and thoroughly flushed and not permit stagnation and consequent decomposition of its contents. If the sewer be too small, it will not be adequate for its purpose, and will overflow, back up, etc.; if too large, the velocity of the flow will be too low, and stagnation will result. In the separate system, where there is a separate provision for rain-water, the size of the sewer ought not to exceed six inches in diameter. In the combined system, however, when arrangements must be made for the disposal of large volumes of storm-water, the size of the sewer must be larger, thus making it less self-cleansing.

"To guard against the bad effects of sewer-air, it is necessary to dilute, change, and ventilate the air in sewers. This is accomplished by the various openings left in the sewers, the so-called lamp and manholes which ventilate by diluting the sewer-air with the street-



PLANT OF THE EAST OHIO SEWER PIPE COMPANY, IRONDALE, O.



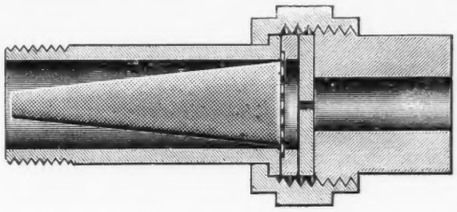
SEWER PIPE IN THE MAKING—ONE OF THE DEPARTMENTS OF THE EXTENSIVE PLANT OF THE EAST OHIO SEWER PIPE COMPANY, IRONDALE, O.

air. In some places, chemical methods of disinfecting the contents of sewers have been undertaken with a view to killing the disease-germs and deodorizing the sewage. In the separate system of sewage-disposal, where sewer-pipes are small and usually self-cleansing, the late Col. Waring proposed to ventilate the sewers through the house-pipes, omitting the usual disconnection of the house-sewer from the house-pipes. But in the combined system such a procedure would be dangerous, as the sewer-air would be apt to enter the house.

"Rain-storms are the usual means by which a thorough flushing of the street sewers is effected. There are, however, many devices proposed for flushing sewers; *e. g.*, by special flushing-tanks, which either automatically or otherwise discharge a large volume of water, thereby flushing the contents of the street-sewers."

The Jet Meter

THE regulation of the flow of water is one of the difficulties overcome by a simple mechanism, known as the "Jet Meter." Is is especially used for the filling of sewer and flush tanks. Gas is supplied to street lamps at a known flow per hour, and flush tanks may be supplied with water in the same manner with this meter. It consists of a washer, with opening of the right size to give any required continuous flow per day, and is especially suited for filling



sewer automatic flush tanks, where the pressure is to be uniform. It contains a strainer made of perforated sheet brass, covered with fine wire gauze, to prevent the hole and washer becoming clogged with foreign substance in the water. The strainer is easily removed for the purpose of cleaning. This meter has been successfully used in many American cities. Fuller particulars, together with the price, may be learned by applying to the Buffalo Meter Co., 290 Terrace, Buffalo, N. Y.

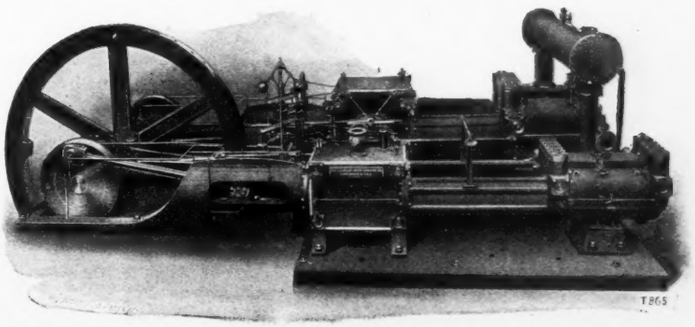
Water Supply By Compressed Air

THE water supply of Los Angeles, California, has in the past been received by gravity, only a few higher parts of the city being supplied by pumping into the mains. The growth of the city, however, has made an additional supply necessary and a pumping plant is to be installed in the southwestern part of the city, where wells have been bored to water-bearing strata lying sixty to two hundred feet below the surface. As these wells are too deep to permit of their operation by pumping engines located on the surface and as it would be commercially impracticable to pump them by deep-well pumps with long plunger rods, and, again, very costly to excavate pumping stations underground near the water level, it has been decided to operate them with compressed air, which offers the further advantages of aerating and cooling the water and permitting one central plant to operate all the wells scattered over a half mile stretch. The system adopted is the air-lift, in which compressed air is forced through one pipe down to the bottom of the well, where it discharges under the mouth of another pipe reaching to the top of the well and emptying into the reservoir. The bubbles of air issuing from the first pipe enter the mouth of the second, but do not fill it completely, as a large amount of water is carried in between the bubbles. For this reason, the weight of water within the second pipe is less than that in an equal cross section of the well exterior to the pipe. The pressure of the water in the well, therefore, is greater and forces the mixture of air and water in the pipe to rise constantly, and as the bubbles of air are continually supplied at the bottom, this process goes on without intermission, the mixture of air and water discharging at the top of the well in a practically constant stream. The air, as it rises toward the top, expands, thereby returning the work which was expended in its compression, and as in expansion the temperature of air is greatly reduced, it serves at the same time to cool the water.

In the present case, the twelve wells will discharge into a common reservoir, from which the water will be forced by a pumping engine into the city water mains. The water in the wells at present stands about sixty feet below the surface, but, as has been found in irrigation work in California, the ground level of subterranean water supplies is apt to be lowered considerably by continuous pumping, and the compressor has therefore been designed to pump, if necessary, from a much lower level, being guaranteed to deliver 2,000 cubic feet of air per minute against a pressure of 100 pounds. The contract for the compressor was awarded to the Baker Iron Works, of Los Angeles, who are local agents of the Laidlaw-Dunn-Gordon Co., of New York City, manufacturers of pumping and air-compressing machinery.

The machine which will be installed is of the same type as the one furnished by this company to supply all the compressed air used at the St. Louis Exposition, and which, also, was the only air compressor to receive a Grand Prize from the Jury of Awards of the Machinery Department. The air valves of this compressor are different from those of other compressors in that they combine the quietness and high-speed qualities of mechanically-moved valves with the elasticity of poppet dischage valves, the vales being controlled by what is known as the Cincinnati air-valve gear.

The Los Angeles machine will be of the two-stage type; that is, the air will be partly compressed in a large cylinder, after which it will pass through a cooler, where its temperature will be reduced by passing over tubes containing cold water, to a high-pressure cylinder, where the compression will be completed. The steam engine driving the compressor and forming, in reality, a part of it, the steam cylinders working on the same piston-rods, is also compounded, the steam expanding first in a high-pressure cylinder, after which it passes to a receiver, where it is dried and reheated by high-pressure steam in pipes, after which it finishes its expansion in the



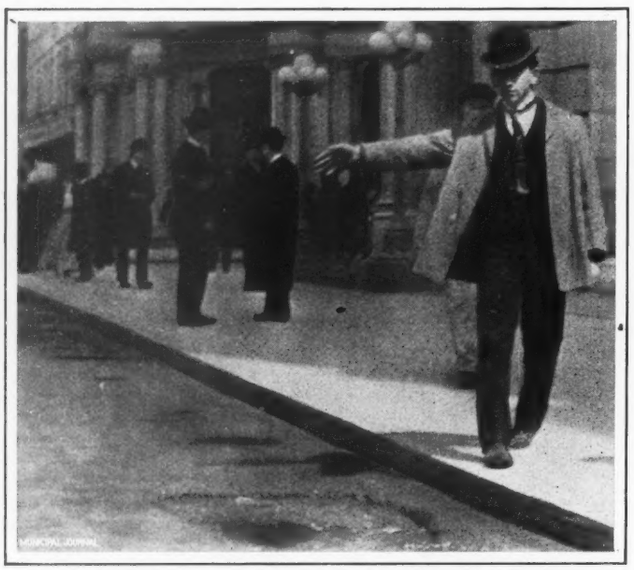
COMPRESSOR MADE BY THE LAIDLAW-DUNN-GORDON COMPANY OF NEW YORK CITY

low-pressure cylinder. The steam is then condensed in a surface condenser and returned to the boiler through reheaters by the boiler-feed pumps. The entire machine is supplied with oil from one central tank and the oil going into the steam cylinders is afterwards removed by a separating device placed in the exhaust pipe. The automatic governor controls both the pressure of the air delivered and the speed of the engine; that is, if the consumption of air is reduced by the shutting off of wells, the engine slows down, maintaining a constant pressure, while if one of the air pipes should break, the speed governor would prevent the engine from running above a certain speed.

—The John Simmons Company, 104 Centre Street, New York, has recently issued a small booklet entitled: "Stand-Pipes and Kindred Fire Protection of the Modern Skyscraper." Fire departments and the commissioners will be interested and can obtain the book for the asking.

"As Good As" Bitulithic

In the January number of The Municipal Journal reference was made to the failure of pavement laid at Paris, Ky., with what was said to be "as good as" bitulithic, and in the April issue to other pavement of the same sort laid at Elmira, N. Y., and St. Mary's, Pa., all showing that these pavements laid by experimental contractors with what was represented to be "as good as" Warren's bitulithic pavement and patterned after the bitulithic construction, had failed.



"AS GOOD AS" BITULITHIC, LAID BY THE ASPHALT TRUST IN FRONT OF THE HOTEL BRESLIN, TWENTY-NINTH STREET, NEW YORK. PHOTOGRAPH TAKEN MARCH 30, 1905, FOUR DAYS BEFORE REMOVAL OF THIS EXPERIMENTAL FAILURE OF THE ASPHALT TRUST

Since then, it has been reported that the "asphalt trust," represented by the Barber Asphalt Paving Company, had made some experiments in making repairs to its defective asphalt pavements in New York, using a mixture of stone and bitumen which attempts to duplicate the bitulithic pavement.

A representative of The Municipal Journal called on Mr. George R. Olney, Chief Engineer of the Borough of Manhattan, to ascertain facts in the matter, and was told by Mr. Olney that in the year 1902, Mr. Clifford Richardson, chemist of the Barber Asphalt Paving Company, told him that he could lay a close mixture of bituminous macadam equal in all respects to Warren's bitulithic pavement, and that since that time Mr. Richardson had, to the personal knowledge of Mr. Olney, laid three pieces of such pavement in New York City; one on Eighth avenue; one at Twenty-ninth street and Broadway, in front of the Hotel Breslin; and one at the intersection of Seventeenth street and Broadway. The Eighth avenue pavement quickly went to pieces and was replaced by asphalt. The section in front of the Hotel Breslin, laid less than a year ago, was, on April 4th, replaced with asphalt by the Barber Asphalt Paving Company. Its "as good as" bitulithic experiments have utterly failed, as shown by the accompanying illustration, taken March 30, 1905, in front of the Hotel Breslin, at which time the pavement referred to was worn into holes extending to the foundation, and the balance of the surface rapidly raveling. The mixture was made of stone of varying sizes mixed with bitumen.

On examination of the intersection of Broadway and Seventeenth street our representative can find no part of the surface made of crushed stone and bitumen, and it is evident that the pavement laid here with "as good as" bitulithic, to which Mr. Olney refers, was some time ago replaced with the regular sand and asphalt mixture made by the Barber Asphalt Paving Company.

It should be here noted that all of the places referred to, where the "Asphalt Trust" had experimented with something supposed to be as good as bitulithic pavement, were made in connection with repairs to its regular asphalt pavement which had previously failed. One of two conclusions is self-evident:

First, the "Asphalt Trust" purposely laid these experimental pieces of pavement in such a way that it knew they would fail and in order to throw discredit on the bitulithic pavement; or, *second*, the Barber Company was experimenting and did not know how to lay a successful pavement of this character; that is, a pavement of stone and bitumen similar to the bitulithic. Whether the Barber Company laid the best pavement it knew how, or whether it purposely laid something which would fail, in order to throw discredit on the bitulithic pavement, it is very evident that municipalities cannot afford to deal with such people on this class of construction.

The American Concrete Mixer

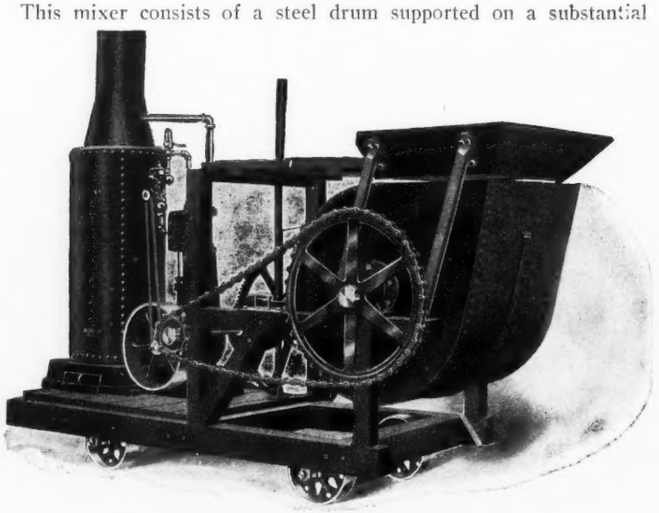
A concrete mixer to be universally practicable must mix any kind of materials in the most thorough, uniform and perfect manner, and in the shortest possible time. It must be equally effective in mixing dry, medium or wet concrete, and to be so constructed that regardless of the consistency of the batch, the concrete cannot possibly accumulate in the drum.

It should be constructed for charging and discharging equally, and the arrangement should be such that it is possible to see the concrete while being mixed.

To properly mix concrete the material must be turned over many times, the bottom must be brought to the top and the mass divided and sub-divided and again combined. This must be done in such a manner that the fine and coarse materials cannot separate, otherwise the mixture will not be uniform. Continually turning in the same direction will not accomplish these results.

The International Fence and Fireproofing Co., Columbus, O., manufactures what is called "The American Concrete Mixer," and it is claimed for this machine that it embodies all the above requirements and in addition is easy to operate, economical and simple in construction. The entire batch of concrete, while being mixed, is within full view of the operator, as also are all working parts of the machine. No matter how wet or how dry the batch may be it can be discharged from the machine instantly by a slight movement of the clutch lever by the operator's hand.

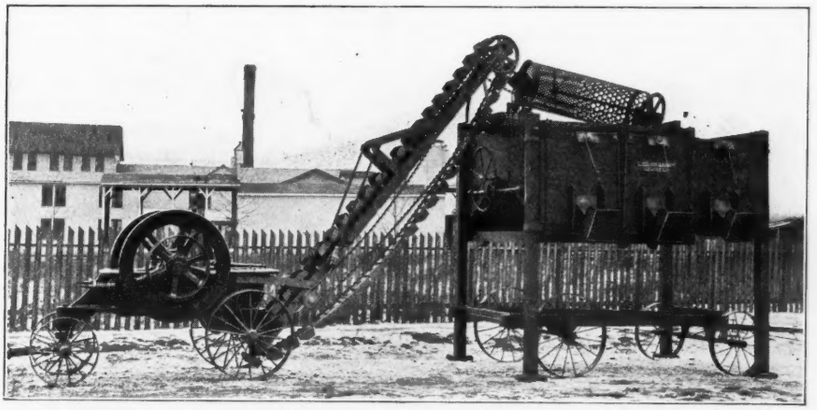
This mixer consists of a steel drum supported on a substantial



oak frame, as will be noted in the accompanying illustration. Extending through the center of this drum is a heavy steel shaft, on which the plow arms are keyed. During the mixing process this drum remains in an upright position. When ready to discharge, a slight movement of a lever engages a friction clutch on the main drive shaft, bringing the drum immediately to the discharging position. This machine may be charged and discharged while running at full speed; after discharging, the drum automatically returns to its upright position and without a moment of lost time the machine is ready for another batch. A well illustrated catalogue, which gives a more complete description, can be had on application to the company.

Portable Good Roads Machinery

FEW subjects are attracting more widespread attention than that of the construction of good roads, village, town and city streets. The tendency of the times is to make liberal use of all machinery which will in any way expedite this class of work. For this reason



PORTABLE GOOD ROADS MACHINERY PLANT SOLD BY THE CONTINENTAL RAILWAY EQUIPMENT COMPANY, NEW YORK CITY

the readers of THE MUNICIPAL JOURNAL will be interested in the accompanying illustration, which shows a road-making outfit, consisting of a combination stone crusher, sifter, screen and bin, which among other advantages numbers that of being distinctly portable. This outfit is built by the Indiana Road Machine Company. The makers claim that size for size it will do more work at less cost and with fewer repairs than any outfit on the market, and they guarantee them in every particular.

The Continental Railway Equipment Co., of 42 Broadway, New York City, is the Eastern agent for the Indiana Road Machine Company, and can deliver this outfit promptly. Information received by THE MUNICIPAL JOURNAL from every State in the Union, which has a good roads department, indicates that more miles of improved roads will be built this year than ever before. This means that a large amount of road-building machinery will be needed in every section, and therefore prompt delivery is a consideration not to be overlooked when ordering.

$350 Offered in Prizes*

THE author whose paper is judged to be the best will receive a prize of $250. The author whose paper is second in rank will receive a prize of $100.

The merit of the papers will be judged chiefly from the standpoint of their practical usefulness to an engineer who proposes to establish a local business in the manufacture of concrete blocks.

The length of the paper should be not less than 5,000 and not more than 10,000 words. It may be accompanied by any drawings or photographs which the author deems necessary for its illustration.

All manuscripts must be typewritten and must be received at the New York office of this company not later than July 31, 1905. They must be signed with some *nom de plume* and accompanied by a sealed envelope bearing on its outside the *nom de plume* and inside the name and address of the author of the paper. Manuscripts and all accompanying matter should be sent fully prepaid by express or registered mail, since their receipt by us cannot be acknowledged in the ordinary manner. They should be marked on the outside of the wrapper. "For the Concrete Block Prize Competition."

As soon as possible after the close of the competition, the manuscripts will be examined by the editors of *Engineering News*, and from the whole number offered, the five best manuscripts will be selected for submission to a jury consisting of Messrs. Robert W. Lesley, Past President of the American Cement Manufacturers' Association; Richard L. Humphrey, President of the Cement Users' Association; and Prof. Edgar Marburg, Secretary of the American Society of Testing Materials. In case the editors experience difficulty in making the primary selection, a larger number than five may be submitted to this jury.

As soon as the selection is made by the jury, the sealed envelopes will be opened and public announcement made of the result of the competition. The prize articles will be published in *Engineering News* and in the *Cement Age*. The Engineering News Publishing Company will have the right also to publish any other articles submitted in the competition and not awarded a prize, or any portions of such articles, paying the author for the matter so used at our regular rates for contributed articles. The right is also reserved to copyright the prize articles or others accepted for publication; and the matter may later be published in book form.

See *Engineering News* of March 16 and March 23, 1905, for editorials relating to the demand for information concerning concrete blocks.

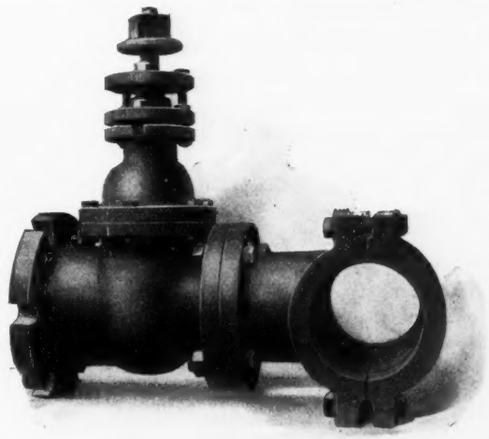
* The sum of $225 will be paid to the winners by the Engineering News Publishing Co., which has instituted the competition, and $125 by the publishers of the *Cement Age*.

Concrete Block Machines

THE makers of the Winget concrete block machine claim that it has the greatest speed and can be run most economically. This point of perfection is due to the automatic opening and closing of the mould box with one single movement, thus delivering a perfect block in the shortest possible time. As a matter of fact, it is claimed, that this block machine is superior to all others, because of its rapid action, its completeness, and its adjustability. The latter quality is one which insures the greatest variety of shapes and sizes that are required in modern architectural design, and no pains have been spared to equip it with the most complete attachments, so that it covers all kinds of construction, such as columns, curves, angles, chimneys, pilasters and many others. The Winget Concrete Machine Company, of Columbus, O., the makers of this machine, have issued a fully illustrated, descriptive catalogue, which will be sent to any address upon request.

Water Works Equipment Company

THE Water Works Equipment Company was incorporated in New Jersey in 1904 for the purpose of manufacturing, selling and



dealing in water-works specialties of all descriptions. One of the most successful features of the first year's business has been the manufacture and sale of an improved flanged faced sleeve—shown in accompanying illustration—using a flanged faced Rensselaer valve in connection with the same.

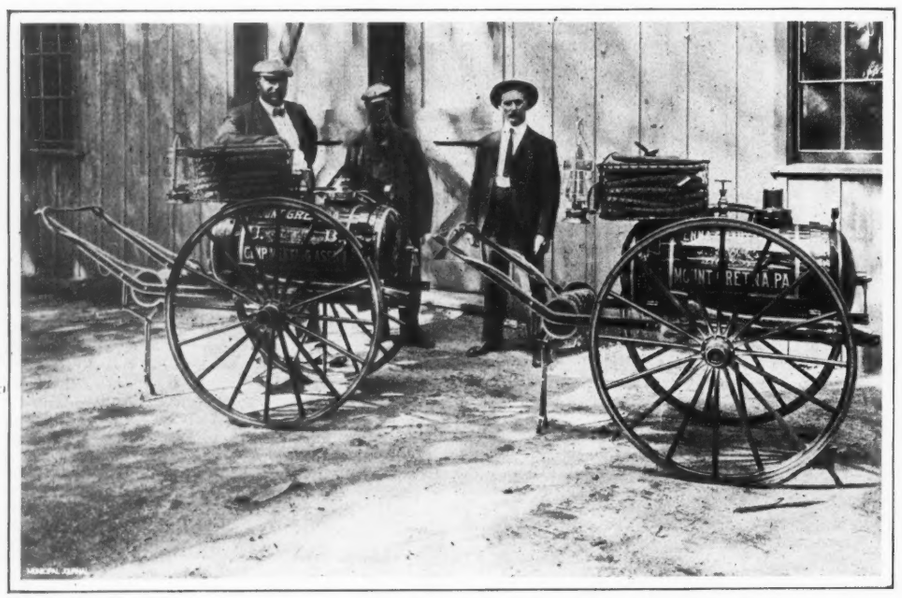
This sleeve is the invention and the result of thirteen years' ex-

perience of General Manager W. H. Van Winkle, who found that there was a demand for an improvement on the type of sleeve that was on the market, and so thoroughly practical are all its features that it has practically been adopted wherever it has been offered. It is said that no one in this particular line has had a broader experience than Mr. Van Winkle, and the instant favor with which this invention has been adopted shows how much the improved type was needed. The offices of the company are at 180 Broadway and the officers are: J. M. Lowden, president; J. W. Griffin, vice-president; F. D. Lincoln, secretary and treasurer.

The Diggs Fire Engines in London

The fire apparatus of American manufacturers is gaining a foothold in Great Britain. It is being generally used by both the manufacturers and the municipalities. A London correspondent, in writing about the Diggs machine, shown in the accompanying illustration, says:

"With regard to the wheeled engine, we have made several tests and find its working all that can be desired. It is a very easy running machine, one of our workmen having run a mile with it empty in seven and one-half minutes. He was in his ordinary working clothes when he made this record. About one-half the business in American fire apparatus, including extinguishers, has been for



ONE OF THE STYLES OF THE DIGGS' FIRE ENGINES SENT TO LONDON, ENGLAND

use in municipalities. The fire brigades that use the Diggs apparatus are among the largest in the country."

The captain of a fire company in Italy, Texas, writes:

"I have used the No. 11 Engine at two or three fires and find it all right. I have no criticisms to make."

Another official from Enhaut, Pa., says:

"The two engines bought of you have been used at three fires, and the service rendered by these engines was of the best and a high pressure was maintained throughout. At times it was over 150. Words of praise and approval were heard on all sides, in regard to the small No. 11 Engine, at a recent firemen's parade at Steelton, Pa. I have no criticisms to make."

—The American La France Fire Engine Company, of Elmira, N Y., manufacturer of the metropolitan fire engine, won out in a competitive test with the Nott fire engine at Winona, Minn., on April 14th. It is reported by the American Company that its engine outclassed the Nott engine on points and superiority of construction, the result giving ninety points to the Metropolitan and sixty to the Nott. The contract was awarded to the American Company.

An Efficient Trolley Car Fender

That there is made a trolley car fender which works perfectly under the most exacting circumstances is shown by the following news item taken from the *New York World* of April 5, as follows:

"When Henry Miller, five years old, of 6 Zabriskie street, Jersey City Heights, was crossing Central avenue yesterday, holding a brightly colored Easter egg in each hand, a trolley car bore down upon him.

"The motorman desperately tried to bring his car to a standstill and almost succeeded. The little fellow was tossed into the fender. Even the eggs he held in his hands were not broken."

This was what is known as a "Providence" fender. It is made by The Consolidated Car Fender Company, 39 Cortlandt street, New York.

Growth of Warren Brothers' Company

The readers of The Municipal Journal are familiar with the work of the Warren Brothers' Company, but all are not so conversant with the facts concerning its progress in the paving world. The development of this concern is succinctly described in the following excerpt from the *Boston News Bureau*, the leading financial paper of that city:

"The Warren Brothers Company has met with unprecedented success with its bitulithic pavement, which combines the good qualities of asphalt and macadam roadway and eliminates their faults, especially the slipperiness of the former and the uncleanliness of the latter, and lack of durability of both. The essential difference between the bitulithic and what is commonly known as the asphalt pavement is that the bitulithic is made of a combination of varying sized particles of hard stone mixed in a heated condition with specially prepared waterproofing bituminous cements, in such proportions that the resulting concrete, when compressed on the street, has the density of solid rock and a rough surface affording a good foothold. The so-called asphalt pavement is a combination of 90 per cent. sand and 10 per cent. asphalt, which has neither the density, durability, nor superior foothold of the bitulithic pavement. Perhaps the most forcible exemplification of the success of the pavement is the remarkable record of its progress.

"From its first organization the company has regularly paid interest on its bonds and 1½ per cent. quarterly dividends on its preferred stock, and a substantial surplus has been accumulated and a dividend of 1 per cent. on the common stock paid since January 1 of this year. At the meeting of the directors on the 22d inst. the company declared a dividend of 1½ per cent. on its preferred stock, and an additional dividend of 1 per cent. on its common stock; dividends being payable April 1 to stockholders of record March 29. All the securities of the company have been placed and it is understood there is a strong financial support back of the company, there being among the stockholders many well-known Boston and other investors."

Wood Block Replaces Asphalt Block in Chicago

As is generally known, Michigan Boulevard in Chicago sustains an enormous traffic. The part of this boulevard in front of the Auditorium Hotel was paved with kreodone wood blocks in the month of June, 1900. They have given such satisfaction to the South Park Board of Chicago that it has contracted with the Republic Chemical & Creosoting Co., of Indianapolis, to put down additional paving on Michigan Boulevard near Van Buren street.

In the same month of 1900 that the kreodone blocks were put down, especially selected asphalt blocks were laid in an adjoining area, which are now being replaced by the kreodone wood blocks.

After five years of heavy traffic the kreodone blocks show practically no wear and are in as good condition as the day they were laid. The South Park Board has had no expense for repairs on the kreodone pavement during the five years, and is greatly pleased with the results. Mr. J. T. Foster, general superintendent of the South Park Commissioners at Chicago, will give any information desired regarding this pavement.

The following is from the report of the Commissioner of Public Works, nearly two years ago, on the two pavements mentioned: "The kreodone block pavement on the Rush street bridge was laid in the latter part (November) of the year 1899. The roadway is still in good condition and shows an average wear of about one-eighth of an inch a year. The traffic on this bridge is unusually heavy. The pavement in front of the Auditorium Hotel shows absolutely a uniform wear, and while the traffic on the said pavement is very great, owing to its being a boulevard, the wear is not as great as the wear on the Rush street bridge."

The Bartlett & Snow Company Fire

THE many patrons and friends of The C. O. Bartlett & Snow Company, of Cleveland, O., will regret to learn that it recently met with a severe loss by fire. In a letter to THE MUNICIPAL JOURNAL, dated April 13th, the company writes:

"We met with a severe loss by fire on the 11th of April. The fire broke out about 12:30 A. M., and almost immediately spread throughout the main buildings. Thirteen fire engines and two fire boats responded to the call.

"Our main buildings were badly damaged. The office buildings were not much damaged and our boiler and engine were not badly injured. Our greatest loss was in patterns. The largest part of our machinery was not seriously injured.

"We have immediately commenced to get our buildings in shape and expect to start up in the machine shop department next week and in our boiler shop within two weeks. The Ohio Ceramic Co., the McMyler Mfg. Co., the Bowler Foundry Co. and the Cleveland Gas Light & Coke Co., and others have kindly offered us the free use of some of their tools, therefore we will be able to complete our contracts and fill our orders with little delay.

"We ask that our patrons and friends be a little patient with us, assuring them that the delay will not be long.

"We can fill small orders from stock which was not damaged."

Items of Interest about the Trade

—WHEN traveling from New York to Chicago, if you would consult your own convenience, comfort and peace of mind, you will go by the Lake Shore Route. This is the road over which the Twentieth Century Limited and the Lake Shore Limited travel. The descriptive illustrated book of trains, telling all about this route, can be secured by applying either in person or by letter to A. J. Smith, General Passenger and Ticket Agent, Cleveland, O.

—The Toledo Construction & Supply Co., of Toledo, O., owns the exclusive territorial rights for the use of the "Economic Sheet Asphalt Heater," with the privilege of selling or subleasing as follows: In the States of New York, Pennsylvania, New Jersey, Delaware, Illinois, Alabama, Mississippi, Georgia, North Carolina, South Carolina, Louisiana; in the District of Columbia; and in the cities of Detroit, Cleveland and Toledo.

—The recent test of two standard Worthington triple expansion engines, without high duty attachment, installed at the Brooklyn Water-Works, Millburn, L. I., shows satisfactory results for engines of this type. The semi-rotary valves used in this engine insure economical distribution of steam. The cylinders and re-heaters are jacketed with steam at boiler pressure. Catalogue W. 30 ML. can be had by addressing Henry R. Worthington, 113 Liberty street, New York.

—The C. O. Bartlett & Snow Co., manufacturers of mill and labor-saving machinery, report the receipt of more business than can be well attended to. The sales recorded come from all parts of the country, besides the receipt of many inquiries from foreign countries.

—The Stratton Fire Clay Company, of Empire, O., has purchased the Ohio River Sewer Pipe Plant, together with its large stock of sewer pipe, fittings, etc., and the two plants will, hereafter, be conducted under the one management.

—General Passenger Agent George H. Daniels, of the New York Central & Hudson River Railroad Co., has recently issued "Four Track Series No. 38," which gives an idea of what the New York Central lines are doing to place before the inhabitants of the earth the wonders of America, and particularly those in the territory served by this great system of American railways, which accommodates more than one-half of the entire population of the United States and a very large proportion of the population of the Dominion of Canada. It also handles a considerable business to and from the Republic of Mexico. A copy of this leaflet may be had on application at any of the offices of the Central, or by letter addressed to the General Passenger Agent, Grand Central Station, New York.

—There will be in the year 1905, a larger number of miles of streets and highways improved than in any previous year of the good roads and good streets movement. As an illustration of this activity, the great demand for road and street-building machinery upon the Austin Mfg. Co., of Chicago, with branch offices in Atlanta, New York City and San Francisco, is noted. For example, this company reports the sale of gyratory crushers and complete crushing plants during the past six weeks as follows: Iowa, one; Ohio, five; Michigan, one; Virginia, two; Pennsylvania, four; Alabama, two; Missouri, five; Illinois, four; California, four; Indiana, six; Kansas, one; Kentucky, one; New York, two; Tennessee, one; North Carolina, one; Washington, one; Minnesota, one; Ontario, Canada, two; Manitoba, Canada, one; Brazil, two; Australia, four. A number of these plants are to be used for municipal purposes only.

—The Warren Asphalt Paving Co. has recently been incorporated under the laws of the State of Massachusetts, with the main offices at Cambridge, Mass. The company has a paid-up capital of $25,000, and its officers are: George C. Warren, president; George H. Perkins, secretary; Alfred H. Johnson, treasurer. The object of the corporation is to continue the business previously done by the copartnership existing under the same name, consisting of refining and furnishing asphalt, asphalt paving plants, and expert advice to paving contractors, together with contracting for the laying of asphalt pavements, making a specialty of Warren's Acme asphalt, which has been used during the past four years in Utica, N. Y.; Toronto and London, Canada; Winnipeg, Manitoba; Davenport, Ia.; Omaha, Nebr.; Boston, Mass.; St. Louis, Mo.; and other cities.

—The advertising representative of a large number of concerns engaged in the manufacture of machinery and allied industries have formed an organization to be known as the Technical Publicity Association. The first annual meeting, dinner, and election of officers will be held in the rooms of the Hardware Club in the Postal Telegraph Building, New York City, on the evening of April 27th, when an address will be delivered by Mr. E. P. Harris, well known as a broker of trade and technical journals.

Trade Publications Received

—THE Carson Trench Machine Co., 16 Dorrance street, Charlestown, Boston, Mass., has issued a series of catalogues telling all about its excavating and refilling machinery used in the digging of trenches for water and gas pipes and sewer systems. It is a wonderful machine, and the catalogues contain a large amount of information that will be interesting to city engineers, boards of public works, mayors and contractors. The catalogues may be had for the asking.

—The John Simmons Co., 96 Centre street, New York City, has just issued a new catalogue, describing the "Victoria Acetylene Generator." It is liberally illustrated and contains all the facts necessary to give even a layman a comprehensive understanding of this system of lighting.

—The National Bridge Co., of Indianapolis, Ind., has recently issued a beautifully descriptive catalogue of 48 pages and cover. It contains many illustrations of bridges, which it has erected in all parts of the country.

—The Berger Manufacturing Co., of Canton, O., has just issued a catalogue of sixteen pages and cover, entitled "The Armor Plate of Modern Business." It tells all about the steel furniture which it manufactures. It is a catalogue which city treasurers, auditors, and, in fact, all city officials will be interested to have.

—The Aylward-Sons Co., of Neenah, Wis., has recently issued a twelve-page catalogue with cover. This contains a lot of interesting information that will be of value to any city official who has to do with the construction or maintenance of a sanitary system of sewers, plumbing, or the like.

—The St. Louis Expanded Metal Fire Proofing Co., Century Building, St. Louis, Mo., has recently issued a large catalogue of 168 pages with cover. It contains many beautiful and practical illustrations, showing its work in construction and completed. It contains many valuable tables and cannot fail to be of service to city engineers and all others who have to do with engineering construction in the city.

—*The Publicity Magazine* is the title of a periodical published monthly by the Under-feed Stoker Company of America, Marquette Building, Chicago, at fifty cents per year in advance. Besides giving interesting facts about the value of the "Jones Stoker," it contains reading matter, both prose and poetry, gleaned from its exchanges. But the thing which will interest city officials most is the information which it gives about the economic value of the underfeed stoker.

—The Western Wheeled Scraper Co., of Aurora, Ill., has just issued a 96-page illustrated catalogue, telling all about its line of goods manufactured, including wheels and drag scrapers, elevating graders, ditchers and wagon loaders, railroad and township plows, steel reversible graders, rock and oar crushers, elevators and screens, dump cars, ore cars, stone cars, dump carts and wagons, street sweepers and garbage carts.

—E. F. Stoddard & Co., Washington, D. C., are sole agents for the United States for what are known as the "Lake Patents." These patents provide for a particular process of manufacture of stone and hollow building blocks, suitable for residences, churches, city halls and other public buildings, as well as all kinds of construction work where natural stone is now used. The catalogue is well illustrated, showing specimens of the various kinds of stone manufactured, as well as some of the completed buildings.

—The Fabric Fire Hose Co., of New York City, has issued a handbook of forty-eight pages with cover, beautifully printed and illustrated. It contains many valuable tables, such as "Showing the Capacity of Cisterns and Tanks," "Work Done By and Power Required for Fire Screens"; besides it contains information about "First Aid to the Injured" that cannot fail to be of interest and value to not only every fireman in the service, but boards of fire commissioners as well.

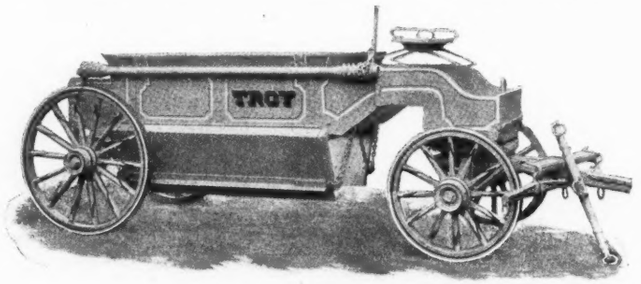
—The Nevin & Wetmore Iron Works, of Lowville, N. Y., have recently issued a handsome 32-page illustrated catalogue, which tells about the product of their factory, including centrifugal pumps as well as wood pulp machines.

THE MERIDEN, CONN., SYSTEM OF STREET SPRINKLING provides that property owners representing more than one-half of the linear feet of the abutting property may petition the Board, all petitions to be filed by a specified date. The Board then prepares specifications of the work to be done and advertises for bids, the contract being let to the lowest bidder. The cost is assessed proportionately on all abutting property owners. The water is supplied free of charge by the city. March 15th begins the sprinkling season and it ends November 15th.

The Troy Dump Wagon

DUMP wagons of various sizes, adapted to the needs of the contractor and municipalities, are the latest addition to the line of high grade wagons, which have so long been manufactured by the Troy Wagon Works Company, of Troy, O. This class of wagon is intended primarily for use by contractors, for city street work, and is better adapted to many other kinds of work than the ordinary wagon. The illustration herewith will give a general idea of the "No. 2 Troy Bottom Dump Wagon, Open," which has a capacity of one and one-half cubic yards, and is one of the sizes in general use.

From descriptive matter, which the makers will furnish to any interested parties, it is learned that some of the special features claimed are with reference to the bottom of the box and the device for dumping the load and again closing the bottom. The wagon will drop an entire load of material in one place, and it is not necessary for the driver to leave the seat or stop the team.



The bottom is made of two sheets of re-enforced steel, one overlapping the other to prevent leakage of load, and is held in place by chains at either end which wind over large spirals. A simple device, which the makers state is hard to disarrange or get out of order, controls these spirals and chains, and is operated by the lever near the driver's seat. When released, the bottom doors part and drop from the center, and, as they are hinged to the sides, the material is dropped underneath the wagon. The spirals on which the chains wind, also permit the bottom to be closed easily and rapidly, by means of the same lever that releases the load, operated in the opposite direction.

In the construction of the body of the wagon, hard wood of the best quality is used, which is heavily ironed and well braced to give long life and withstand rough usage. This wagon is furnished with any desired capacity, from one and one-half to five cubic yards.

Street Sweeper Approved by Exposition

THE Lewis and Clark Exposition, now building at Portland, Ore., has officially adopted the "pick-up" street sweeper made by the Sanitary Street Sweeping Company, of Washington, D. C.

This is the hand pick-up sweeper which was used so effectively on the floors and smooth pavements of the Louisiana Purchase Exposition while the Fair lasted. It is the one which has been used with perfect success in Washington, St. Louis, Columbus, O., and many other municipalities, both large and small, throughout the country. Wherever used it has demonstrated its efficiency and economy of service. In one year in Washington, according to the statement of the superintendent of street cleaning, these machines saved the city over $15,000. With this machine it is possible to clean your streets at a cost, per thousand square yards, of from 12 to 20 cents, according to local conditions.

This is the time of year to experiment with these machines, as it is the beginning of the season. Send to the company the total amount, in square yards, of smooth pavements with a detailed statement as to cost and present methods of cleaning this area and an estimate will be sent you, showing the approximate cost, as nearly as it can be determined without a personal inspection of the actual condition, of cleaning your streets and show you what can be saved. It is not adapted for use on block stone or granite or cobblestone pavements, but it will clean all kinds of smooth pavements to perfection. Send for full particulars.